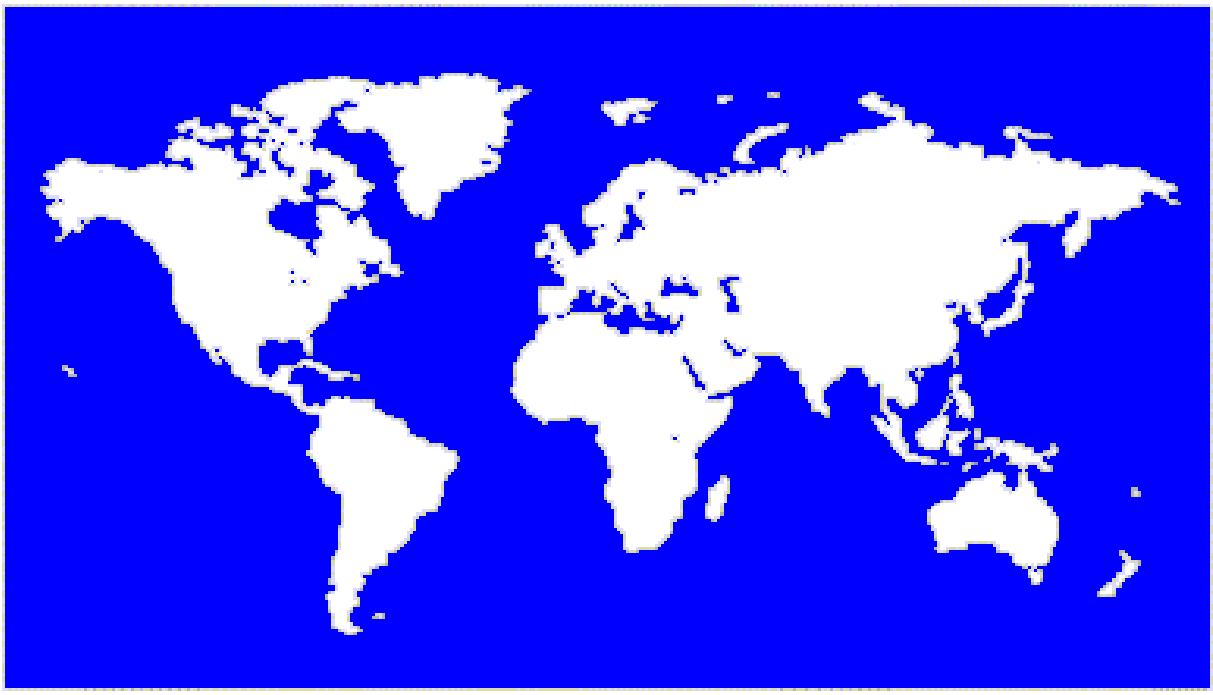
MOTOROLA

StarTAC130 (GSM)



The World's Leading Cellular Telephone Manufacturer

Service Manual

MOTOROLA

GSM StarTAC130 PERSONAL CELLULAR TELEPHONE

Service Manual
Ver 1.0

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PERFORMANCE SPECIFICATIONS - StarTAC130 (GSM)

GENERAL

Frequency Range	890-915 MHz Tx 935-960 MHz Rx
Channel Spacing	200 kHz
Number of Channels	124 carriers with 8 channels per carrier
Modulation	GMSK at BT = 0.3
Transmitter Phase Accuracy	5 Degrees RMS, 20 Degrees peak
Duplex Spacing	45 MHz
Frequency Stability	+/- 0.10 ppm of the downlink frequency (Rx)
Voltage Operation	+3.9 to +6.0V dc (battery)
Transmit Current	<225 mA typical (DTX on at 50%)
Dimensions	140 mm (L) x 50 mm(W) x 27 mm(D) with battery
Size (Volume)	157 cubic cc
Weight	Approximately 170g; includes 650mAh NiMH battery
Temperature Range	-20°C to +55°×C

TRANSMITTER

RF Power Output	33 dBm +/- 2dB
Output Impedance	50 ohms (nominal)
Spurious Emissions	-36 dBm up to 1 GHz, (<-30 dBm > 1 GHz)

RECEIVER

RF Level	-102 dBm
RX bit error rate (100 kbits)	< 2%
Channel Hop Time	500 microseconds
Time to Camp	Approximately 10 seconds

SPEECH CODING

Speech Coding Type	Regular Pulse Excitation / Linear Predictive Coding with Long Term Prediction. (RPE LPC with LTP.
Bit Rate	13.0 kbps
Frame Duration	20 ms
Block Length	260 bits
Classes	Class 1 bits = 182 bits. Class 2 bits = 78 bits
Bit Rate with FEC Encoding	22.8 kbps

Specifications subject to change without notice

CAUTION

Do not jump start vehicle or use an automotive battery charger while the vehicle adapter option and the portable radiotelephone are connected to the vehicle electrical system as this may cause serious damage to the radio. Disconnect the radio by removing the cable kit fuses.

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GSM StarTAC130 PERSONAL CELLULAR TELEPHONE
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FOREWORD

1. SCOPE OF MANUAL

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Major changes which occur after the printing date are incorporated by Cellular Manual Revisions (CMR). These CMR's are added to the manuals as the engineering change is incorporated into the equipment.

2. MODEL AND KIT IDENTIFICATION

Motorola equipments are specifically identified by an overall model number on the nameplate. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them. When a production or engineering change is incorporated, the applicable schematic diagrams are updated.

MOTOROLA SERVICE POLICY (StarTAC130)

Warranty:

Product will be sold with the standard 12 months warranty terms and conditions. Accidental damage, misuse, retailers extended warranties will not be supported under warranty. Non warranty repairs will be available at agreed fixed repair prices. Proof of purchase will be required to validate warranty claims.

Core Product:

A low cost service strategy (To be agreed with the European Customer Service Managers now called the "Lo tier Loaner program") will be available. The customers original telephones will be repaired but not refurbished as standard. Alternatively the product may be supported under the current Express Exchange program as operated by local Service Organisations.

Appointed Motorola Service Hubs will perform warranty and non warranty field service for level 2 (assemblies) and level 3 (limited pcb component). The Motorola HTC centres will perform level 4 (full component) repairs.

Customer support (End User):

Customer support (End User) will be available through dedicated Call Centres and In Country Help Desks.

Product Service training should be arranged through the local Motorola National Support Centre.

REPLACEMENT PARTS ORDERING

ORDERING INFORMATION

Only centres authorized by Motorola to carry out repairs will be able to purchase spare parts. Orders for spare parts from HUB's, Motorola National Support Centres and Hi-Tech Centres, should be placed with the appropriate Motorola Parts Distribution Centre.

BOARD REPAIRS

All centres authorized to carry out module level repairs, must return faulty boards to the appropriate HUB or Motorola Hi-Tech Centre for repair to component level.

GENERAL SAFETY INFORMATION

PORTABLE OPERATION:

DO NOT hold the radio so that the aerial is very close to, or touching, exposed parts of the body, especially the face or eyes whilst transmitting. The radio will perform best if it is held in the same manner as you would hold a 'land' telephone handset, with the aerial angled up and over your shoulder.

DO NOT operate the portable phone in an aircraft. Switch off your telephone. The use of a cellular telephone in an aircraft may be dangerous to the operation of the aircraft, disrupt the Cellular Network, and is illegal. Failure to observe this instruction may lead to a suspension or denial of Cellular Telephone Service to the offender, or legal action, or both.

MOBILE/PORTABLE OPERATION - Telephone use in Vehicles:

All equipment must be properly grounded according to installation instructions for safe operation.

Users are advised to turn off their equipment when at a refuelling point.

Safety is every drivers business. Cellular telephones should only be used in situations in which the driver considers it safe to do so.

GENERAL:

DO NOT allow children to play with any radio equipment containing a transmitter.

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere. Mobile telephones are, under certain conditions, capable of interfering with blasting operations. When you are in the vicinity of such work, look out for and observe signs cautioning against mobile radio transmission. If transmission is prohibited, **you must turn off** your mobile telephone **to prevent any transmission**.

In standby mode the mobile telephone will automatically transmit to acknowledge a call if it is not turned off.

Refer to the appropriate section of the product user manual for additional pertinent safety information

All equipment should be serviced only by a qualified technician.

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GSM StarTAC130 PERSONAL CELLULAR TELEPHONE
LABELLING AND SIM CARDS
TRANSCEIVER LABELLING

TRANSCEIVER LABELLING

1. INTRODUCTION

Each Motorola GSM transceiver will be labelled with various number configurations. The following information shows and explains the common labelling titles

2. TITLE EXPLANATIONS

2.3 MSN

The Mechanical Serial Number (MSN) is an individual number, uniquely identifying the unit. The MSN will remain the same throughout the units life, even if the main board is replaced. Because the MSN is unique to the whole phone, it is often used for logging and tracking purposes by Motorola National Service Centres on EPPRS. The MSN is divided into the sections shown in Figure 1.

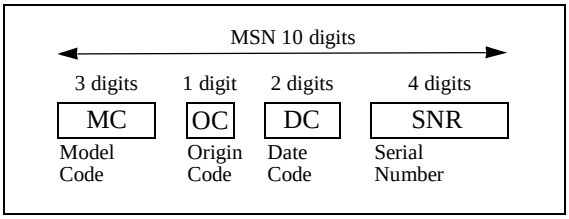

Figure 1. MSN Configuration

2.4 CEPT GSM

This is the International Mobile Station Equipment Identity (IMEI) number. The IMEI is held in the logic circuitry.

If the main board is replaced then the units IMEI will change, therefore the units labelling should be updated with the new IMEI. An IMEI uniquely identifies a mobile station equipment to the system, and is divided into the sections shown in Figure 2.

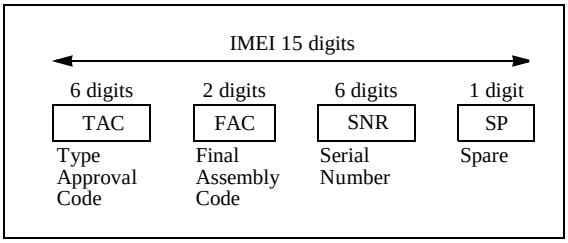

Figure 2. IMEI Configuration

2.5 REV S/H

This configuration consists of two blocks of two digits, and denotes the software and hardware versions within the unit. The first two digits correspond to the software version, and the last two digits correspond to the hardware version. If a version update is carried out on the unit, the corresponding change information should be made apparent on the labelling.

2.6 MODEL

The model number defines the type of product. Each product type is issued a common model number.

2.7 PACKAGE

The package number is used to determine the type of equipment, the mode in which it was sold, and the language with which it was shipped.

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SIM CARDS

1. INTRODUCTION

The Motorola StarTAC130 personal cellular telephones are designed to work with the mini Subscriber Identity Module (SIM). The SIM card contains all the personal data required to access GSM services. Data held by the SIM card includes:-

- International Mobile Subscriber Identity
- Temporary Mobile Subscriber Identity
- Home system
- Services subscribed to
- PIN and unblocking codes
- Call barring codes

The SIM card may also be capable of storing phone numbers, names, and messages.

2. SIM CARD INSERTION/REMOVAL

The SIM card must be inserted into the unit correctly so that the card can be read, and the data checked for validity, before operation on the system will be enabled. The card contains all of the user's personal identification numbers and details of the system the phone operates on.

Figure 1. Inserting the Test SIM card

The miniature SIM card is placed in the tray and the tray slide into the side of the phone. There is only one way for the miniature SIM to fit because of the .shape of it. The tray should be completely and secuerly seated in the slot on the side of the phone.. To remove the SIM card from the unit, pull the sliding mini SIM tray sideways away from the phone. The User Guide contains full information about inserting and removing the mini SIM card.

3. SECURITY INFORMATION

To stop unauthorized personnel using your SIM card, the option of using a Personal Identity Number (PIN) is available. When enabled the option requires (on power up) a verification number to be entered via the unit's keypad, before the card can be used. Three attempts to enter the correct PIN may be made. If after the three entries the correct PIN has not been entered, the card becomes blocked. To unblock the card an unblocking/super PIN code must be entered. Ten attempts to enter the correct unblocking code are permitted, if after ten attempts the correct code has not been entered, the SIM card is corrupted and becomes useless.

Another option available for the SIM card is call barring. If subscribed to, the call barring of incoming and/or outgoing calls may be accomplished by entering a special key sequence. The key sequence includes a "barring code", which determines the type of restriction incorporated, and a password to validate the request. The initial password is provided when you subscribe to the service. The password can be changed by entering a set key sequence.

A valid miniature sized SIM card can be used in any working GSM transceiver, regardless of the manufacturer, which is compatible with the miniature size SIM card. To protect the actual unit from unauthorized use, a lock function on the hardware is available. When enabled, this function requires that a three or four digit unlock code be entered, via the unit's keypad, before normal operation of the transceiver can take place. The lock code can be changed by entering a set key sequence.

Note: Further information on set key sequences can be derived from the unit's user guide.

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MANUAL-TEST MODE

1. INTRODUCTION

The Motorola StarTAC130 personal cellular telephones are equipped with a manual-test mode capability. This capability allows service personnel to take control of the telephone, and by entering certain keypad sequences, make the telephone perform desired functions. To enter the manual-test mode, a Test SIM card (Part No 8102430Z02, punchout centre)) is required.

2. TEST SIM CARD INSERTION REMOVAL

The Test SIM card must be inserted into the unit correctly to access manual-test mode; this should not be a problem because the card can only fit in one way. Place the mini SIM card in the tray and slid it into the phone.

Figure 1. Inserting the Test SIM card

To remove the SIM card from the unit, pull the mini SIM tray sideways away from the phone.

The User Guide contains full information about inserting and removing the SIM card

3. ACCESSING THE MANUAL-TEST MODE

When the Test SIM card is in place, power up the telephone. Once the initial automatic 'wake up' sequence has taken place correctly, depress the # key (on the units keypad) for three seconds. After three seconds 'TEST' should appear in the display, indicating that the unit is now in the manual-test mode. Table 1 below shows the available manual-test commands and their corresponding results.

Table 1

Command	Result
01#	Exit manual-test mode
19#	Display call processor s/w version
20#	Display modem s/w version
22#	Display speech coder s/w version
57#	Initialize non-volatile memory
58#	Display security code
58xxxxxx#	Change security code
59#	Display lock code
59xxx#	Change lock code
60#	Display International Mobile station Equipment Identity (I.M.E.I.)

Note: If a customer should forget the security code in their unit, it can only be read or changed by using a Test SIM card.

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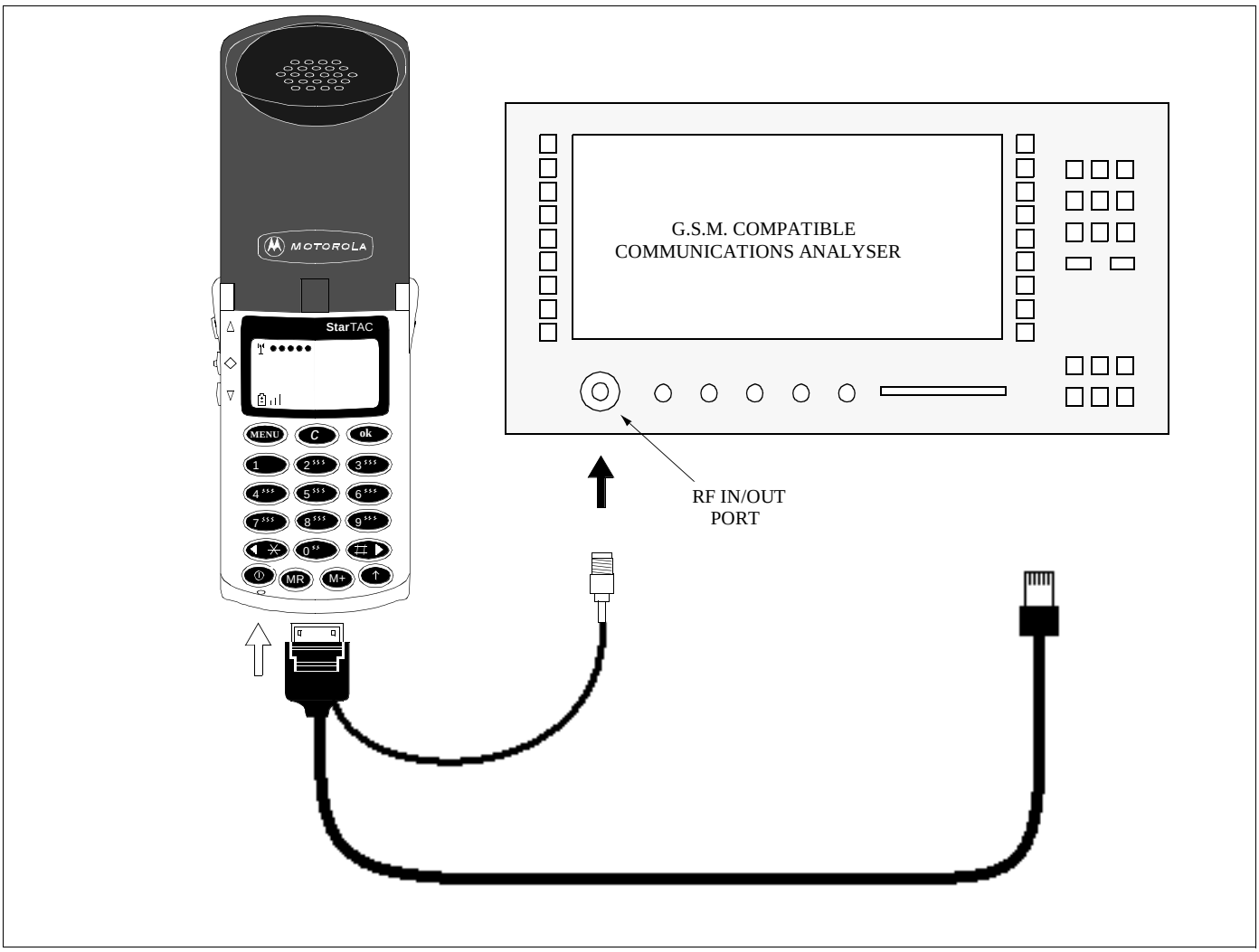

Figure 1: Testing Configuration

VERIFICATION

1. INTRODUCTION

To test an StarTAC130 cellular telephone, to verify whether or not the unit is functioning correctly, the following equipment will be required:-

- G.S.M. compatible communications analyser.
- Test adaptor (Part No SKN4858A), and appropriate cable/connectors.
- Test SIM card (Part No 8102430Z02).
- Charged battery pack.

2. EQUIPMENT CONFIGURATION

Initially insert the test SIM card into the tray of the personal cellular telephone. If required, further information on SIM card insertion is available on page 13. Attach the antenna adaptor to the botton connector of the phone. Slide a charged battery on to the back of the personal telephone, so that the telephone can be powered up. Finally, connect a cable from the test adaptor to the RF in/out port of the communications analyser, and power both the analyser and personal telephone on. The equipment set up shown in Figure 1 should now be in place.

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3. TESTING PROCEDURE

All information required to perform the desired tests and measurements should be obtained from the communication analyser's user manual.

Ensure that the unit being tested is capable of both initiating a call to the analyser, and receiving a call from the analyser. Confirm that the displayed Temporary Mobile Subscriber Identity (TMSI), International Mobile Equipment Identity (IMEI), and dialled number are correct. **When a call is in progress the following tests should be carried out on channels 1, 62 and 124**. The recorded results must be within the acceptable stated limits, if the unit being tested passes all the tests it should be taken as functioning correctly. If the unit being tested fails to conform with any of the expected measurements, it should be taken as faulty and repaired accordingly. The following table states the required tests and tolerances.

TEST TO BE PERFORMED	LOWER LIMIT	UPPER LIMIT
Transmit average phase error (RMS) at peak power		5°
Transmit average phase error (Peak) at peak power		20°
Transmit average frequency error at peak power	-90 Hz	+90 Hz
Transmit power error at level 5 (33 dBm)	-2 dB	+2 dB
Transmit power error at level 7 (29 dBm)	-2 dB	+2 dB
Transmit power error at level 10 (23 dBm)	-3 dB	+3 dB
Transmit power error at level 15 (13 dBm)	-3 dB	+3 dB
Transmit amplitude negative peak flatness	-1 dB	
Transmit amplitude positive peak flatness		+1 dB
Transmit amplitude envelope at -28 us		-70 dB
Transmit amplitude envelope at -18 us		-30 dB
Transmit amplitude envelope at -10 us		-6 dB
Transmit amplitude envelope at 556 us		-6 dB
Transmit amplitude envelope at 564 us		-30 dB
Transmit amplitude envelope at 574 us		-70 dB
Receive Bit Error Test for Class II Residual (at -102 dBm)[4]		2%
Receive Frame Erasure Rate for RES II (at -102 dBm)[4]		0.12%

Note: 1. The transmit average test values should be derived from 10 separate readings.
2. The receive signal strength for transmit measurements should be -85 dBm.
3. The receive test values should be derived from the reception of 20K bits of data.
4. There is approximately 1.8dB loss between the antenna port and the RF SMA connector on the test adaptor. The test specifications are written for the power levels AT THE ANTENNA.

PERSONALITY TRANSFER

1. INTRODUCTION

Personality Transfers are required when a phone is Express Exchanged or when the main board is replaced. The different variations (languages, features) of the StarTAC130 personal cellular telephones requires that each main board must be configured correctly to ensure that the unit takes on the correct personality required. Therefore, when a main board is replaced its personality must be transferred into the new board, so that it functions correctly in the customers unit. There are two possible methods of transfer.

- Normal Transfer, and;
- Master Transfer

If the defective unit powers up, then the Normal Transfer method should be followed. If the faulty unit will not power up, then a Master transfer will be required to configure the replacement board, once installed.

2. NORMAL TRANSFER

This method allows the personality, selected features and stored phone numbers of a defective radio, to be transferred into a repaired radio. Data is transferred from the donor unit into the recipient unit using a Transfer card (Part No 5104025D03). The instruction steps should be followed in order.

Step 1. Insert the Transfer card into the slot located on the back of the donor unit. Turn the donor unit on, the display should show ‘Clone’.

Step 2. The donor unit is now in the cloning mode, and ready to transfer the first block of data.

Step 3. Enter 021# via the unit’s keypad. This command will cause the first block of information to be uploaded into the Transfer card.

Step 4. While data transfer is taking place between the unit and the card, ‘Please Wait’ will be displayed. After a short period of time, if the data transfer has been completed correctly, ‘Clone’ will re-appear in the donor unit’s display.

Step 5. When the first data block has been successfully uploaded, remove the card from the donor.

Step 6. Insert the Transfer card into the slot located on the back of the recipient unit. Turn the recipient unit on, the display should show ‘Clone’.

Step 7. The recipient unit is now in the cloning mode, and ready to receive the first block of data.

Step 8. Enter 03# via the unit’s keypad. This command will cause the recipient unit to download the first data block from the Transfer card.

Step 9. While data transfer is taking place between the card and the unit, ‘Please Wait’ will be displayed. After a short period of time, if the data transfer has been completed correctly, ‘Clone’ will re-appear in the recipient unit’s display.

Step 10. The second data block must now be transferred. Repeat steps 1 to 9, but enter 022# to program the second data block into the Transfer card.

Step 11. The third data block must now be transferred. Repeat steps 1 to 9, but enter 025# to program the third data block into the Transfer card.

Step 12. When the third block of data has been transferred successfully, remove the Transfer card and check the repaired radio functions correctly. See page 19 for further information.

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3. MASTER TRANSFER

This method of transfer should only be followed when the defective unit will not power up, or complete a Normal Transfer. As mentioned earlier, there may be different variations (OEM looks for example) of the Motorola StarTAC130 cellular telephone, each model requiring the main board to be configured differently for correct operation. When carrying out a Master Transfer it is not possible to transfer the customers selected features or stored phone numbers, only the model personality can be programmed into the repaired unit.

Each different version of the StarTAC130 cellular telephone, requires its own Master Transfer card which contains essential set up information. Master SIM cards may be ordered pre-programmed, or created from a Normal Transfer card. The instruction steps should be followed in order.

Step 1. Select the required Master SIM card.

Step 2. Insert the Master Transfer card into the slot located on the back of the repaired unit. Turn the unit on, the display should show 'Clone'.

Step 3. Enter 03# via the unit's keypad. This command will cause the configuration data to be downloaded from the Master Transfer card.

Step 4. While data transfer is taking place between the card and the unit 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the recipient unit's display.

Step 5. When the data block has been transferred successfully, remove the Master Transfer card and check the radio functions correctly. See page 18 for details.

At no point should either 021#, 022# or 025# be entered while a Master Transfer card is in the radio. If either of the stated commands are entered, the master information on the card will be erased. To prevent the above happening the card can be locked by entering 06# via the unit's keypad, with the card inserted. Unlock the card by entering 07#.

Note: If during either transfer process a problem arises, an error message will be displayed. If the Transfer card is removed before the data transfer is completed 'Bad Data on Card' will appear in the display. If either situation arises, the process should be repeated.

4. MASTER SIM CARD CREATION

When required a Master SIM card can be created by:-

Step 1. Insert a Transfer card into a unit which is already configured in the desired way. Turn the unit on, the display should show 'Clone'.

Step 2. Enter 024# via the unit's keypad. This command copies the personality information in the unit onto the Transfer card to create a Master Transfer card.

Step 3. While data transfer is taking place between the unit and the card 'Please Wait' will be displayed. After a short period of time, if the data transfer has been completed correctly, 'Clone' will re-appear in the recipient unit's display.

Step 4. A Master Transfer card has now been created. Lock the card to prevent accidental information erasure (see previous section). Remove the card from the unit, and store until required.

DISASSEMBLY INSTRUCTIONS

1. INTRODUCTION

Reasonable care should be taken during the disassembly and reassembly of the unit in order to avoid damaging or stressing the housing and internal components. Ensure that a properly grounded high impedance conductive wrist strap is used while performing these procedures on electronic units.

CAUTION

Many of the integrated circuit devices used in this equipment are vulnerable to damage from static charges. Ensure that adequate static protection is in place when handling, shipping, and servicing the internal components of this equipment.

2. RECOMMENDED TOOLS

The following tools are recommended for use during the assembly/disassembly of the StarTAC130.

- Anti-Static Mat Kit 0180386A82; includes:
  - — Anti-Static Mat 66-80387A95
  - — Ground Cord 66-80334B36
  - — Wrist Band 42-80385A59
- Plastic Bladed Tool SLN7223A
- Housing prying tool SYN5367A
- Antenna tool SYN5179A
- Dental pick
- Tweezers

3. DISASSEMBLY PROCEDURE

The following information describes the procedure for removing and accessing various parts of the StarTAC130

NOTE

Refer to the mechanical exploded view on page 18, as necessary, while performing the disassembly/assembly procedures.

4. ASSEMBLY PROCEDURE

Once the unit is disassembled and the repair is carried out it then becomes obvious that to assemble the unit, the procedure is the reverse of that previously completed for disassembly.

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1 Use the antenna tool to remove the antenna. Turn counterclockwise until the antenna is free from the housing.

2 With flat surface of tool facing up, insert housing opener at 45 angle. Make sure you can see top of tool in seam.

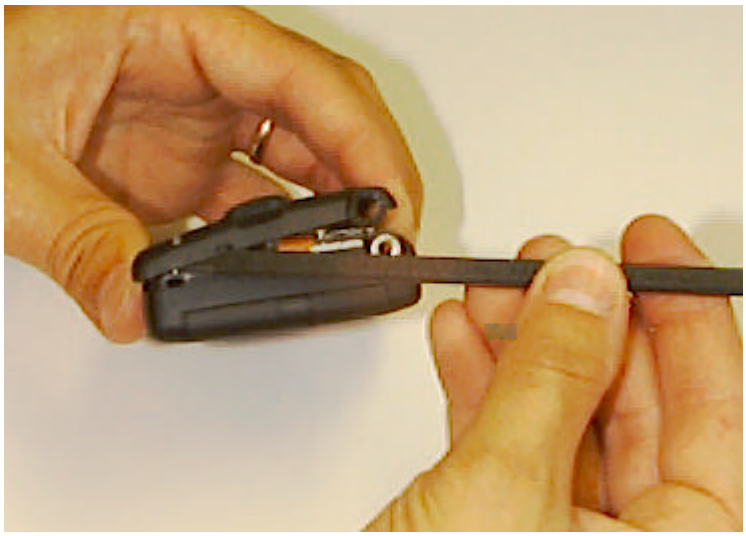
Figure 1 . GSM StarTAC130 Cellular Personal Telephone Disassembly Procedure

3 Press and push corner outwards with left thumb while right hand twists phone lika a rag..

4 After phone has started to open, lift antenna well to release entire side..

Figure 2 . GSM StarTAC130 Cellular Personal Telephone Disassembly Procedure

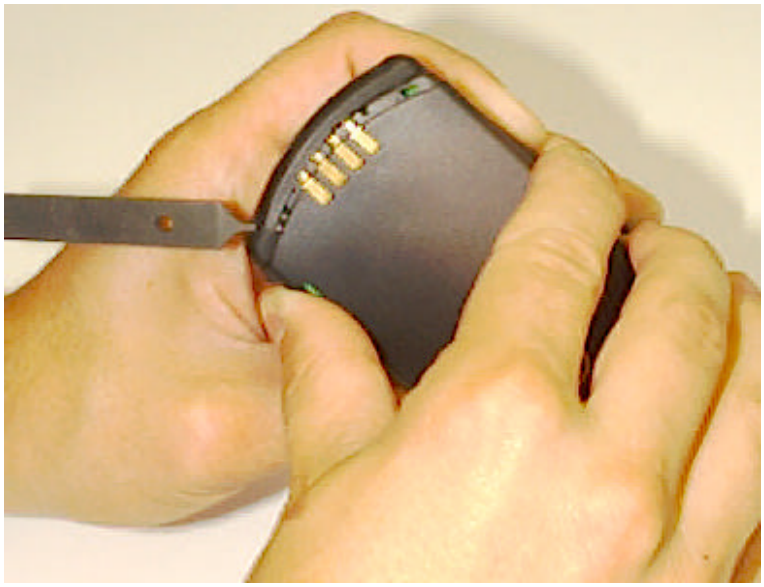
5 Using the plastic prying tool, slide under housing all the way to corner and lift housing



6 With flat surface of tool facing up, insert housing opener at 45 angle. Make sure you can see top of tool in seam.

Figure 3 . GSM StarTAC130 Cellular Personal Telephone Disassembly Procedure

7 Use index finger, pull housing off going straight across the phone.



8 Open the flex connector and pull out the flex.

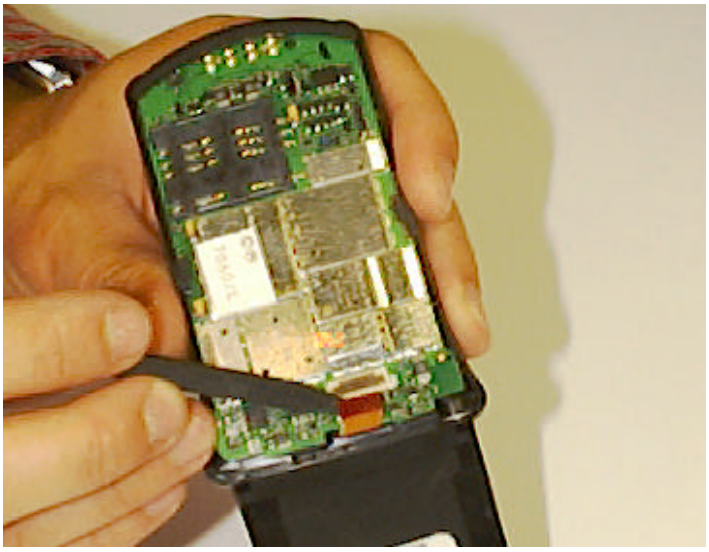
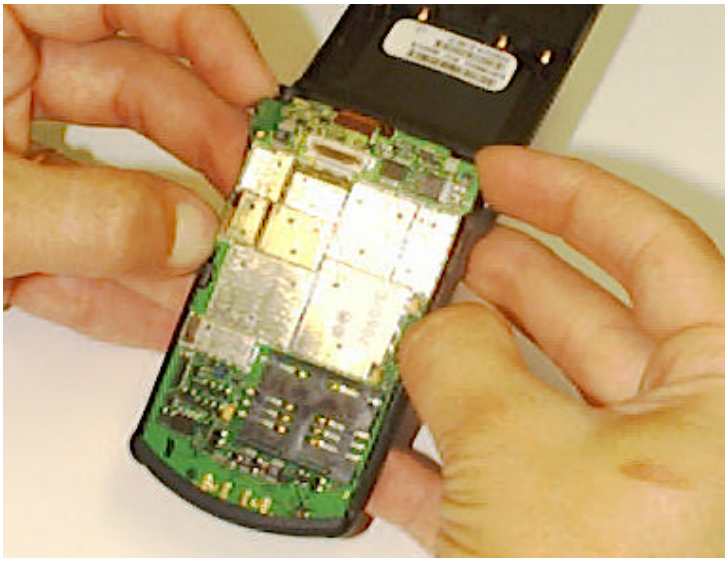


Figure 4 . GSM StarTAC130 Cellular Personal Telephone Disassembly Procedure

9 With your thumbs, pry the side tabs away from board assembly to allow it to be easily removed. Staring at the top of the board, lift the board assembly out of the front housing.



10 Remove the display board from the main PCB.

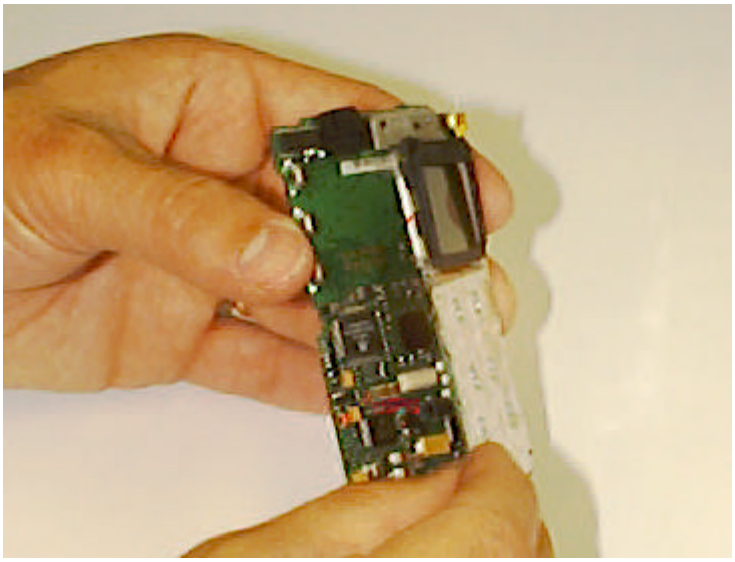
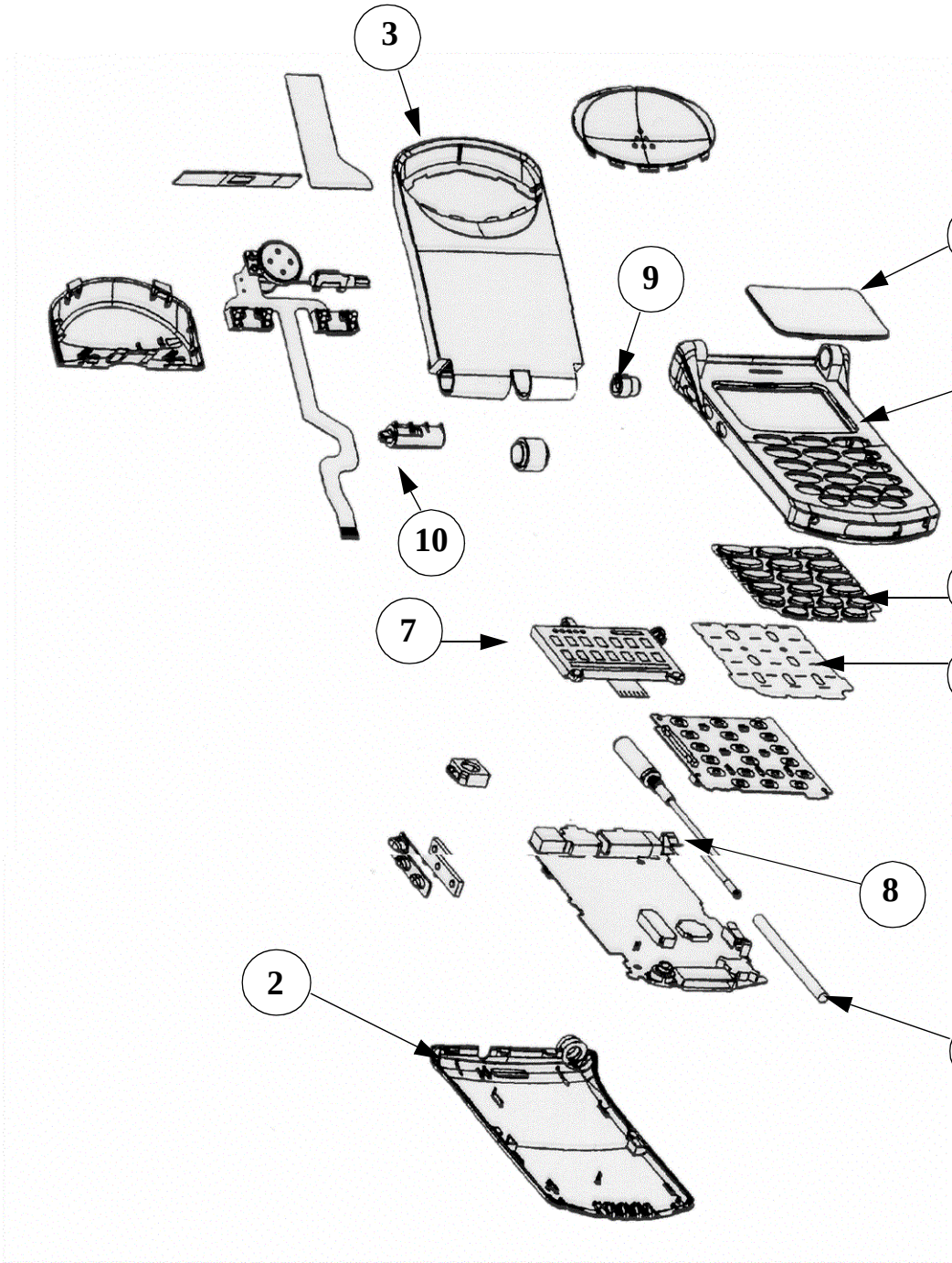


Figure 4 . GSM StarTAC130 Cellular Personal Telephone Disassembly Procedure

11 Using a dental pick, remove the adhesive strip of the base of the phone

12 Using tweezers, press the hinge pin button in and over towards the middle of the flip. Also, move the hinge pin section above the button towards the middle of the flip. Remove the flip by pulling up on the hinge pin side and out on the other side.

Figure 5 . GSM StarTAC130 Cellular Personal Telephone Disassembly Procedure


3
4
9
1
10
6
7
5
8
2
11

REPLACEMENT PARTS LIST

REF. NUMBER	PART No.	DESCRIPTION
	S8332A	Spare Xcvr Number (SWF2952)
	SYN6812A	Display Board
1	0109279U03	Front Housing
2	0109280U02	Rear Housing
3	0104866Z03	Assy Flip
4	6104522Z02	Lens
5	4003745K01	Keypad Mylar
6	3803882K01	Keypad Plastic
7	7209257T02	LCD Display
8	8509098E01	Antenna
9	4709050R01	Shaft Right
10	5509242E01	Hinge
11	3709068T01	Tube Antenna
	0509440M01	Mic Grommet (Not shown)
	5009135L07	Microphone (Not shown)
	0509133T01	Display Grommet (Not shown)
	0509441M01	Alert Grommet

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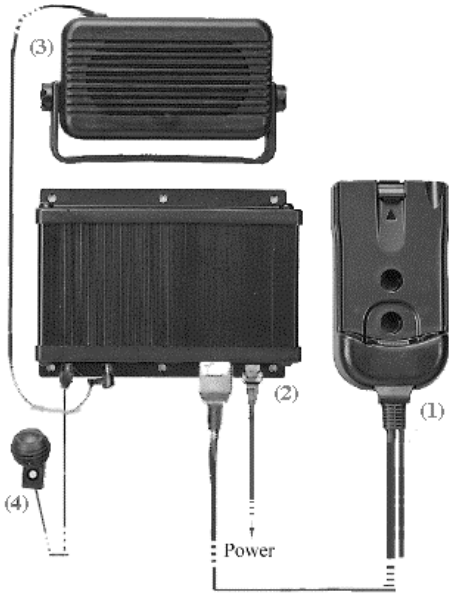
Accessory Product Information



Standard DSP Handsfree Car Kit for StarTAC™

P/N: **HFK9200**

EAN Code : 5025322019542

Content :

(1)	**SYN4974**	**StarTAC Hang Up Cup**
	TRN5502	**Bracket for HUC**
	SYN6900	**HUC Adapter for StarTAC 130**
(2)	**SYN6348**	**Hands Free Electronic Box**
(3)	**SSN4018**	**External Speaker**
(4)	**SMN4097**	**Directional Mic w/Angle**
	SKN4834	**Power Cable 6 PIN**
	SKN4937	**Cable Fuse & Mounting Hardware**
	SYN6967	**Ferrite Bead Kit**
	SJN8205	**Multilingual Install & User Manual**

Description:
The HFK9200 is a professional install handsfree car kit for the StarTAC models with improved full duplex performances. The HFK9200 uses the latest Digital Signal Processor (DSP) technology for high quality audio, and includes all basic handsfree components, hang up cup, DSP HF box, speaker, directional microphone, and cables.

Key DSP Features:

- Superb full digital audio quality and clarity even at high driving speeds
- Improved full duplex audio allowing genuine two-way conversation
- Digital noise cancellation filtering out background noise
- Digital echo cancellation eliminating local and network echo es

Standard Features:

- Full hands-free capability for comfort and safety communication while driving
- Direct RF connection to external antenna, for better coverage
- Directional microphone
- Intelligent rapid charge
- Programmable safety timer

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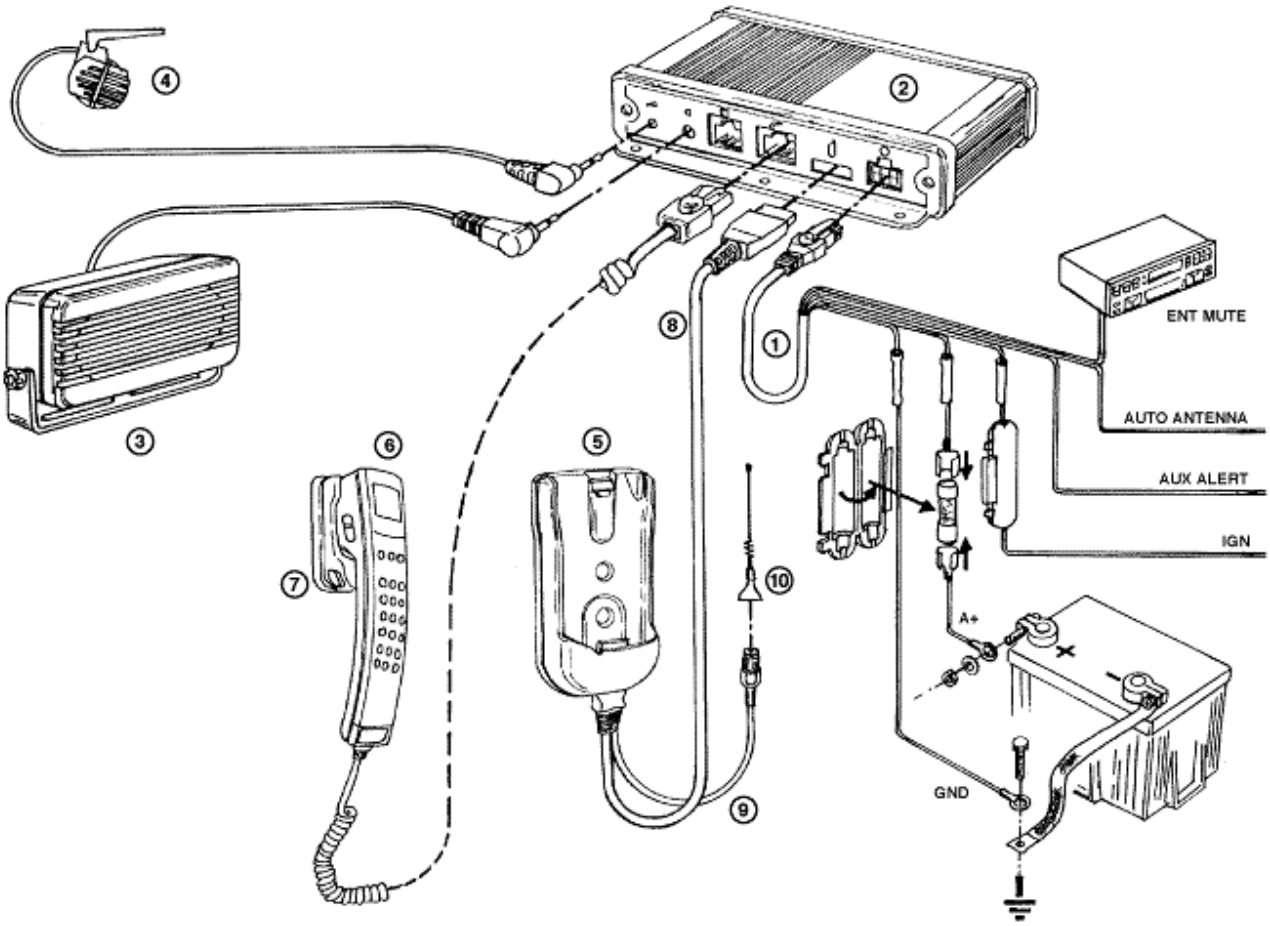
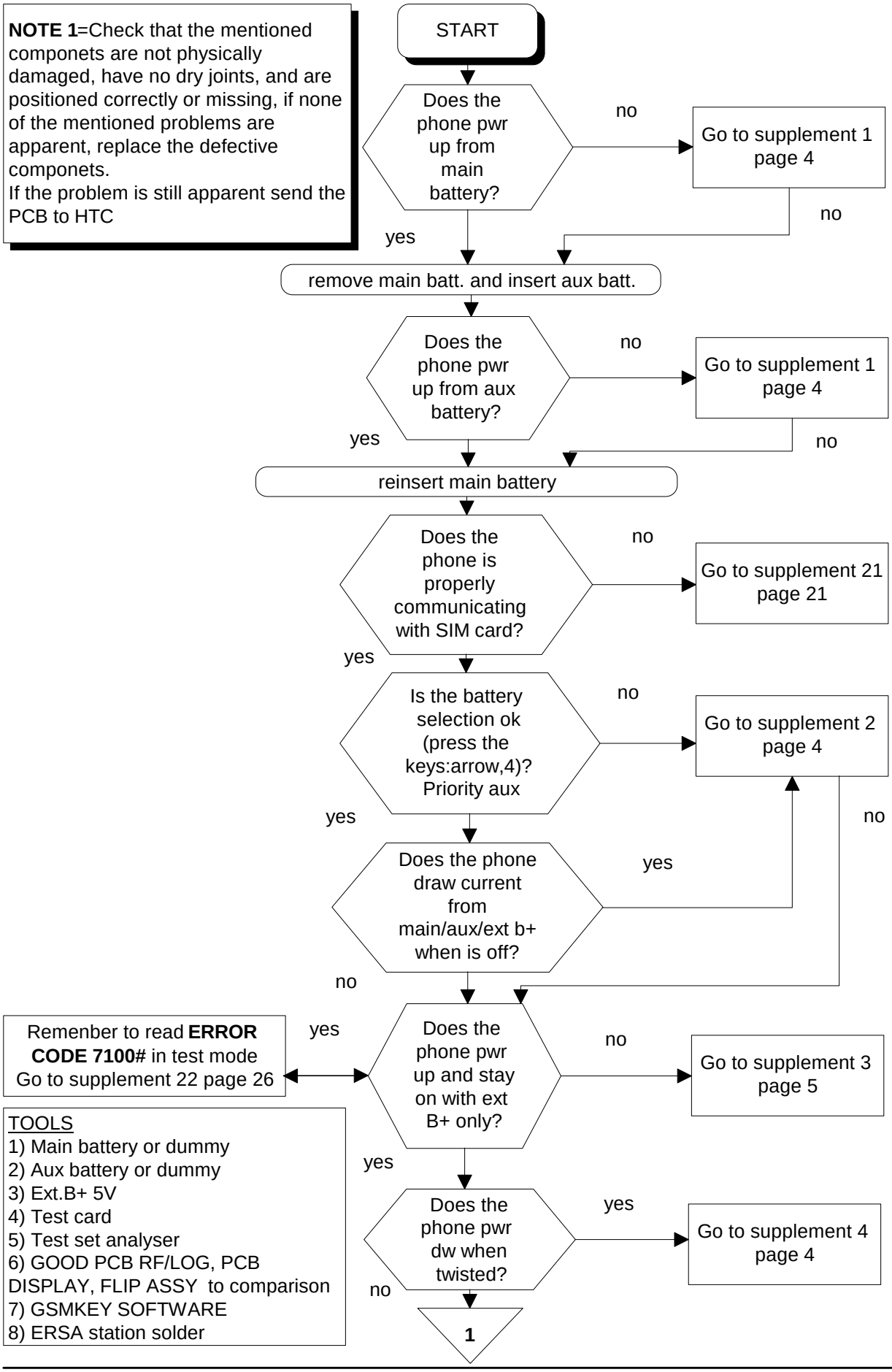
StarTAC DSP Car Kit - Installation Diagram

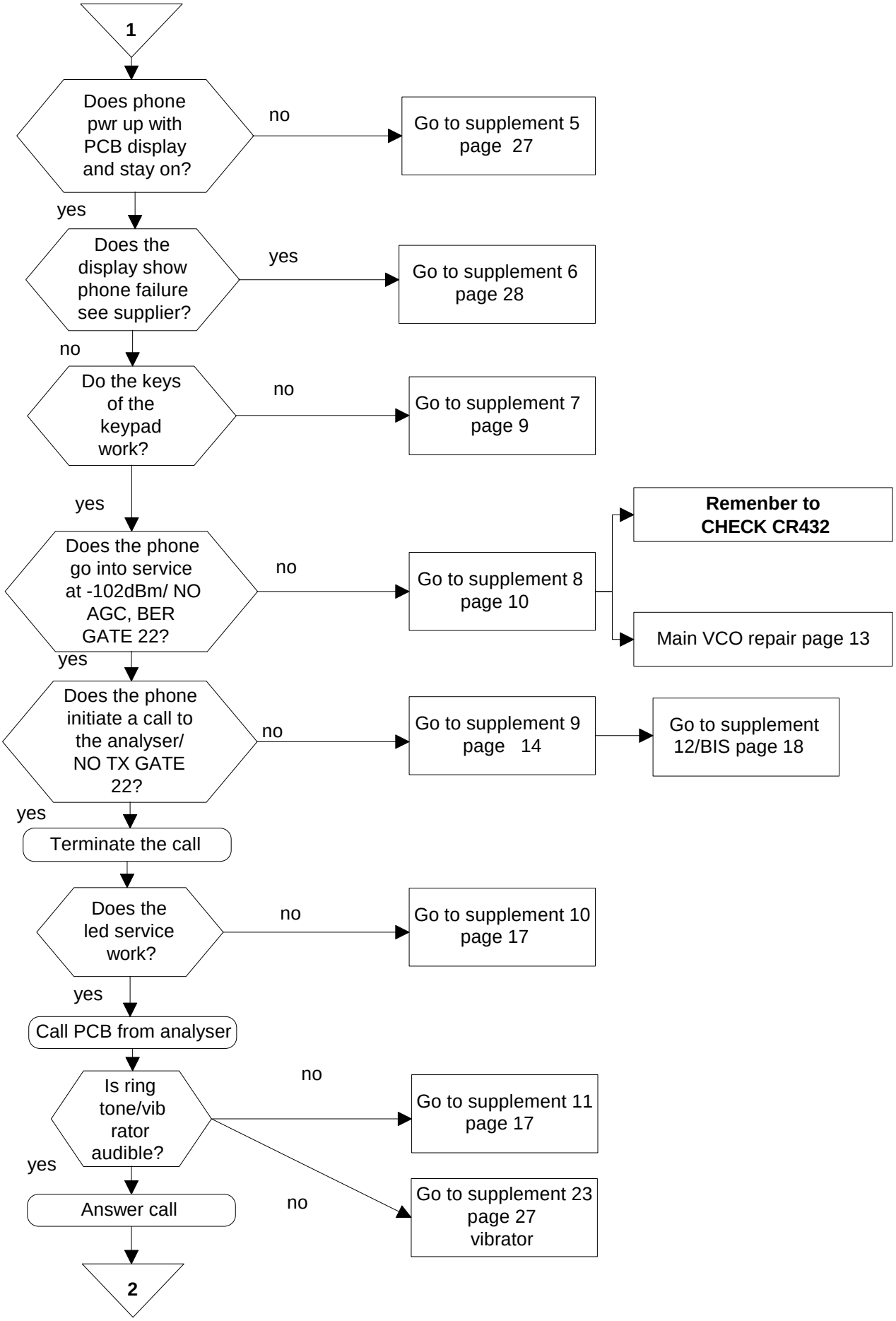


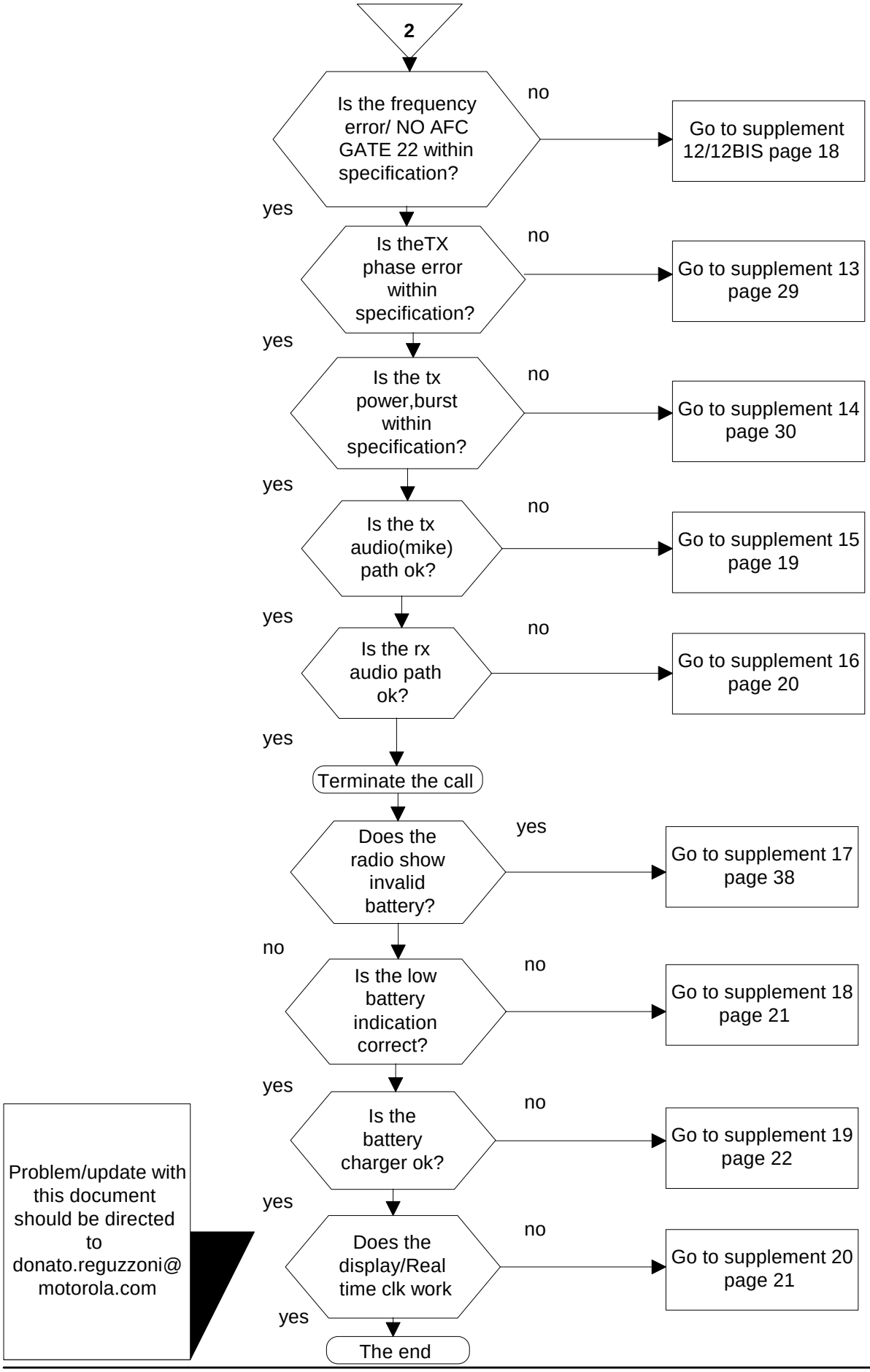
1. FUSE KIT (SKN4468)
2. DHFA ADAPTER BOX (SYN6348)
   (MOUNTING HARDWARE TRN5502 NOT SHOWN)
3. EXTERNAL SPEAKER (SSN4002)
4. DIRECTIONAL MICROPHONE (SMN4097)
5. UNIVERSAL CRADLE (SYN4974)
6. GSM SMART HANDSET (OPTIONAL)
7. SMART HANDSET CRADLE (OPTIONAL)
8. POWER CABLE (SKN4834)
9. RF COAX
10. ANTENNA (NOT INCLUDED)

LEGENDS

RED=A+
BLACK=GND
GREEN=IGN
ORANGE=ENT MUTE
YELLOW=AUX ALERT
BLUE=AUTO ANTENNA

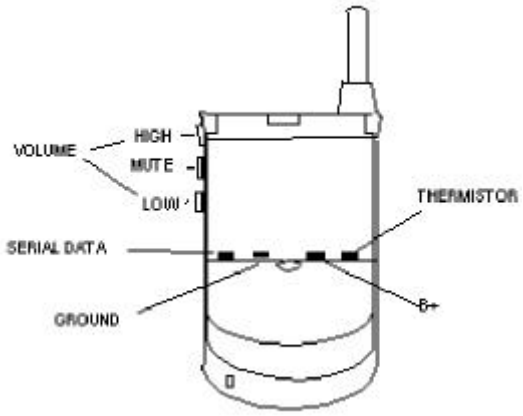

NOTE 1=Check that the mentioned componets are not physically damaged, have no dry joints, and are positioned correctly or missing, if none of the mentioned problems are apparent, replace the defective componets.
If the problem is still apparent send the PCB to HTC
START
Does the phone pwr up from main battery?
no
Go to supplement 1 page 4
no
yes
remove main batt. and insert aux batt.
Does the phone pwr up from aux battery?
no
Go to supplement 1 page 4
no
yes
reinsert main battery
Does the phone is properly communicating with SIM card?
no
Go to supplement 21 page 21
yes
Is the battery selection ok (press the keys:arrow,4)? Priority aux
no
Go to supplement 2 page 4
yes
no
Does the phone draw current from main/aux/ext b+ when is off?
yes
no
Remenber to read **ERROR CODE 7100#** in test mode Go to supplement 22 page 26
yes
Does the phone pwr up and stay on with ext B+ only?
no
Go to supplement 3 page 5
yes
Does the phone pwr dw when twisted?
yes
Go to supplement 4 page 4
no
1
TOOLS
1) Main battery or dummy
2) Aux battery or dummy
3) Ext.B+ 5V
4) Test card
5) Test set analyser
6) GOOD PCB RF/LOG, PCB DISPLAY, FLIP ASSY to comparison
7) GSMKEY SOFTWARE
8) ERSA station solder

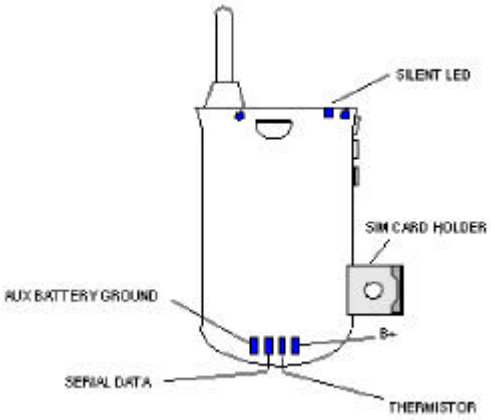

1
Does phone pwr up with PCB display and stay on?
no
Go to supplement 5 page 27
yes
Does the display show phone failure see supplier?
yes
Go to supplement 6 page 28
no
Do the keys of the keypad work?
no
Go to supplement 7 page 9
yes
Does the phone go into service at -102dBm/ NO AGC, BER GATE 22?
no
Go to supplement 8 page 10
Remenber to CHECK CR432
Main VCO repair page 13
yes
Does the phone initiate a call to the analyser/ NO TX GATE 22?
no
Go to supplement 9 page 14
Go to supplement 12/BIS page 18
yes
Terminate the call
Does the led service work?
no
Go to supplement 10 page 17
yes
Call PCB from analyser
Is ring tone/vib rator audible?
no
Go to supplement 11 page 17
yes
Answer call
no
Go to supplement 23 page 27 vibrator
2

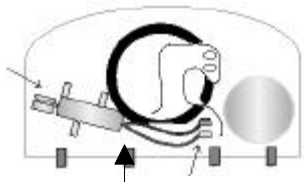

2
Is the frequency error/ NO AFC GATE 22 within specification?
no
Go to supplement 12/12BIS page 18
yes
Is theTX phase error within specification?
no
Go to supplement 13 page 29
yes
Is the tx power,burst within specification?
no
Go to supplement 14 page 30
yes
Is the tx audio(mike) path ok?
no
Go to supplement 15 page 19
yes
Is the rx audio path ok?
no
Go to supplement 16 page 20
yes
Terminate the call
Does the radio show invalid battery?
yes
Go to supplement 17 page 38
no
Is the low battery indication correct?
no
Go to supplement 18 page 21
yes
Is the battery charger ok?
no
Go to supplement 19 page 22
yes
Does the display/Real time clk work
no
Go to supplement 20 page 21
yes
The end
Problem/update with this document should be directed to donato.reguzzoni@motorola.com

Supplement 1
No pwr up main/aux batt.

1) Check the main battery contact flip, B+ no shorting to vibrator, the flex and J601
2) Check the aux battery contact on the PCB and on the rear h.







NO SHORT

Supplement 2
Battery selection

1) It's important to use the paint battery select schematics enclosed on page 24-25.
2) It is recommended to start from the gates of Q999,Q1008 and go back to the inputs.
3) It's likely to the faulty components are NOR logic ports (U904,908,909),NOT(U907),Dual diode Schottky (CR607,608,606).
4) Attention at WATER DAMAGE problem.
5) Attention at Zener diode burned as VR901(8.2V), CR904-CR1001-CR999(6.8V)

Supplement 4
PCB only
Pwr dwn/twisted

Check Y201 main cristal and NOTE 1
(Check 13MHz with osc.scope probe U703 BIC at pin 17 ifit pwr dw hitting)

Supplement 3
PCB only
No pwr up

Set the voltage of power supply 5V
Supply the PCB via ext.conn J600

START

See diagrams on GSM Startac/COSMO Lev.4 procedure No PWR UP

Does the PCB draw a lot of current and also does the alert buzz?

yes

Is L275 short to ground(Use an "Ohm" meter to measuare the terminal of C902 or 903)

yes

Use a power supply (2.75V, 150mA). Supply C902 at terminals and check the hot component. It's likely to micro DCA or C751-753-754-755 (0.047uF)

no

Try to connect the PCB to emmibox if the PCB reblow the appropiate SW from it (see the led status only)

no

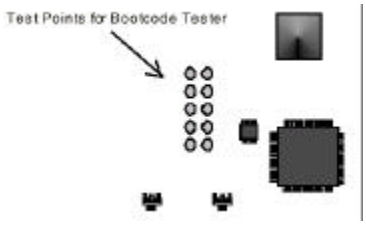
no

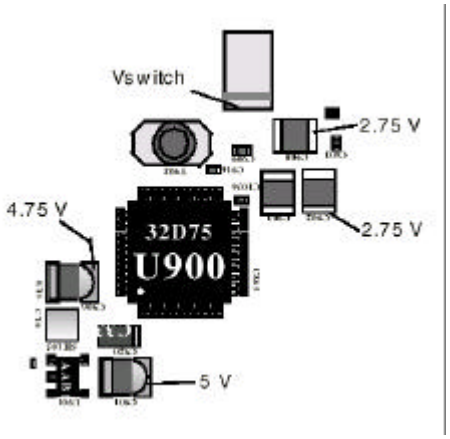
Is 4.73V voltage DC present at U900 GCAP pin 40

no

Check the PCB ext.conn.J600 socket CR903 and NOTE 1

yes





Pull up the w.dog by shorting the pads TP10 - TP1

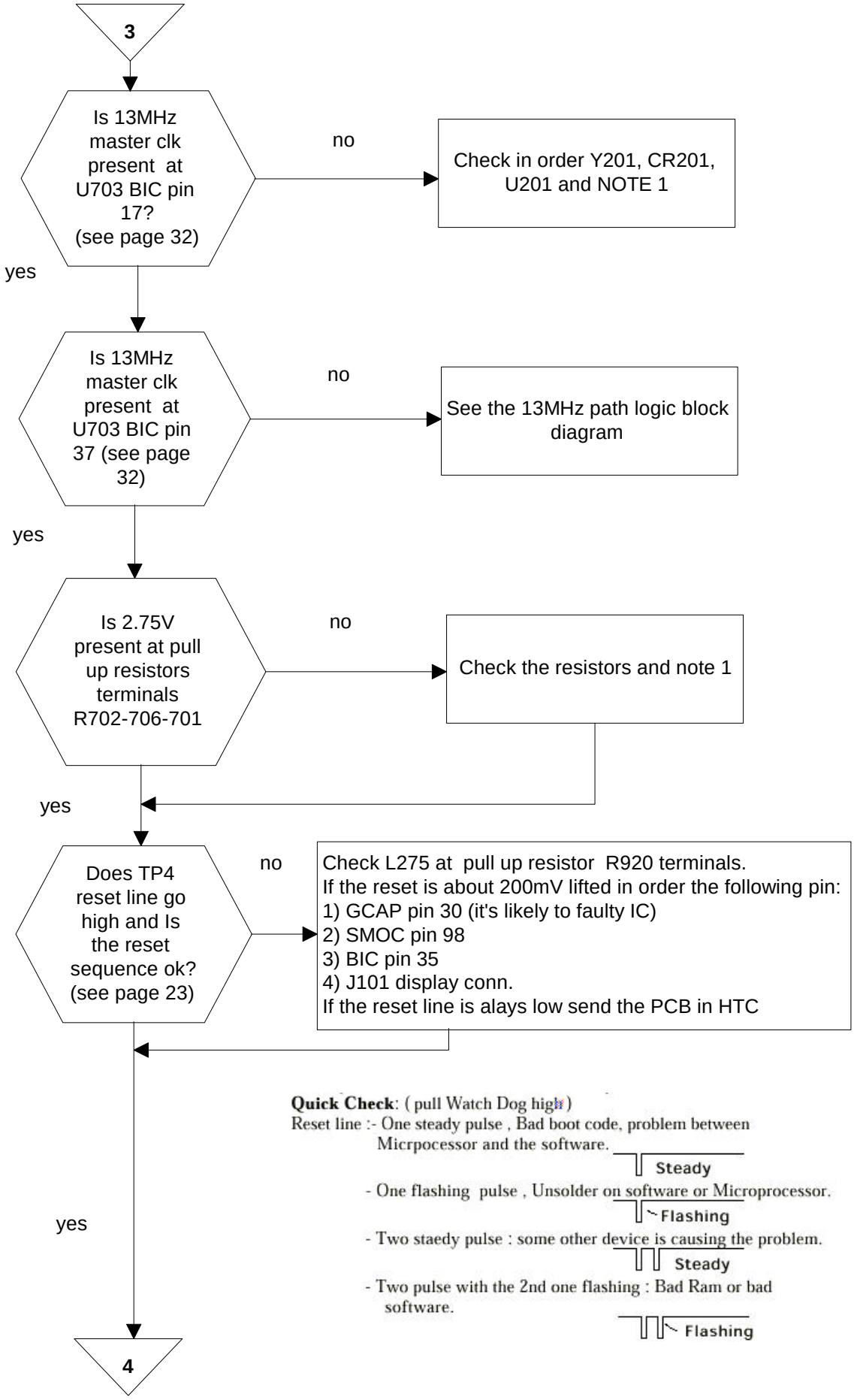
Are U900 GCAP voltage ok(use Osc.scope)?

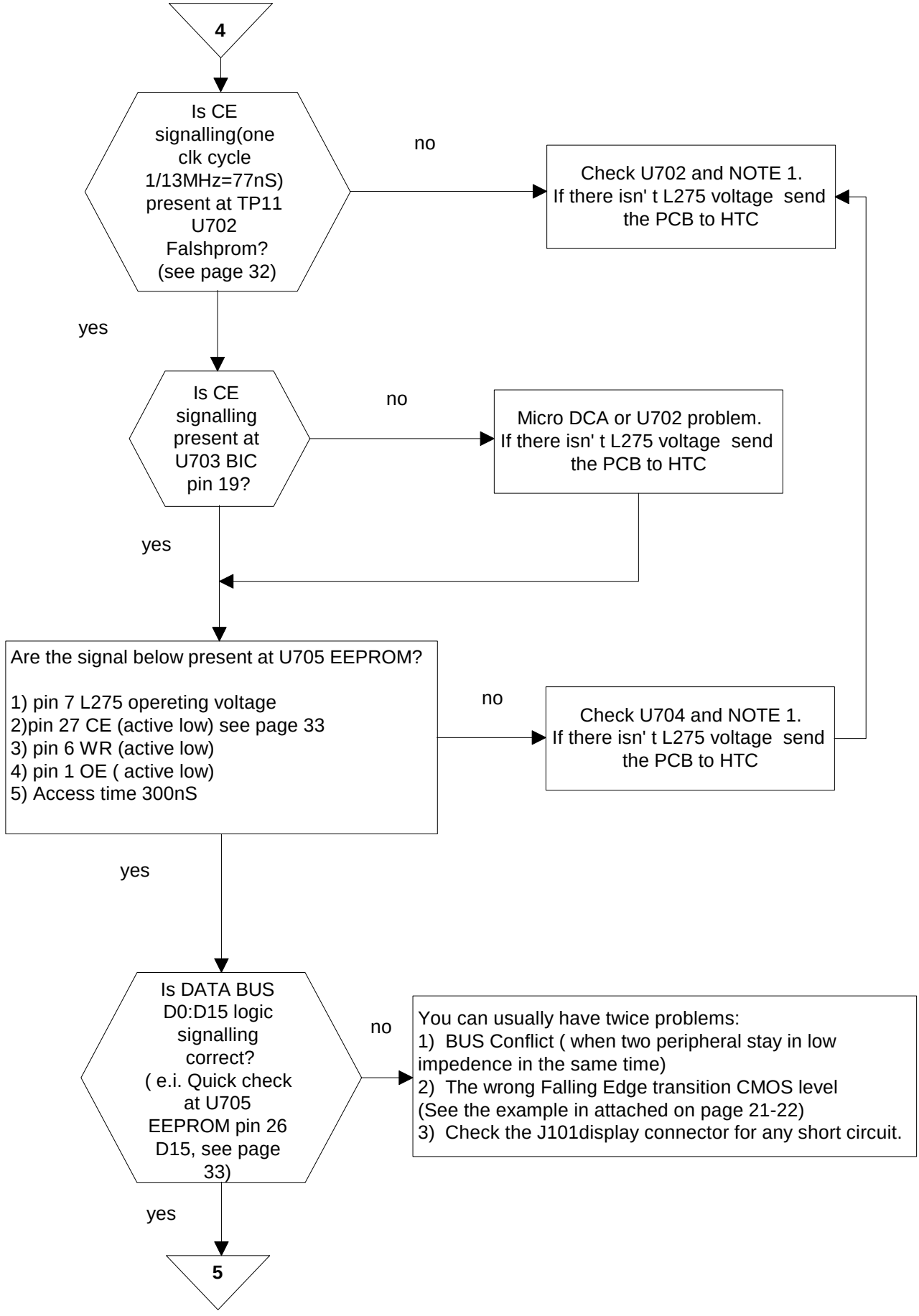
Attention at the tantalio capacitor(orange) polarity.
1) **Vswitch** at C915= 5.6V (NO RIPPLE, it cause the alert buzz if it's present replace C915)
2) **R475** at C906= 4.75V
3) **L500** at C901= 5V
4) **Vref** at C803= 2.75V(it isn't present in the figure)
5) **L275** at C902/903= 2.75V
6) **R275** at C908= 2.75V

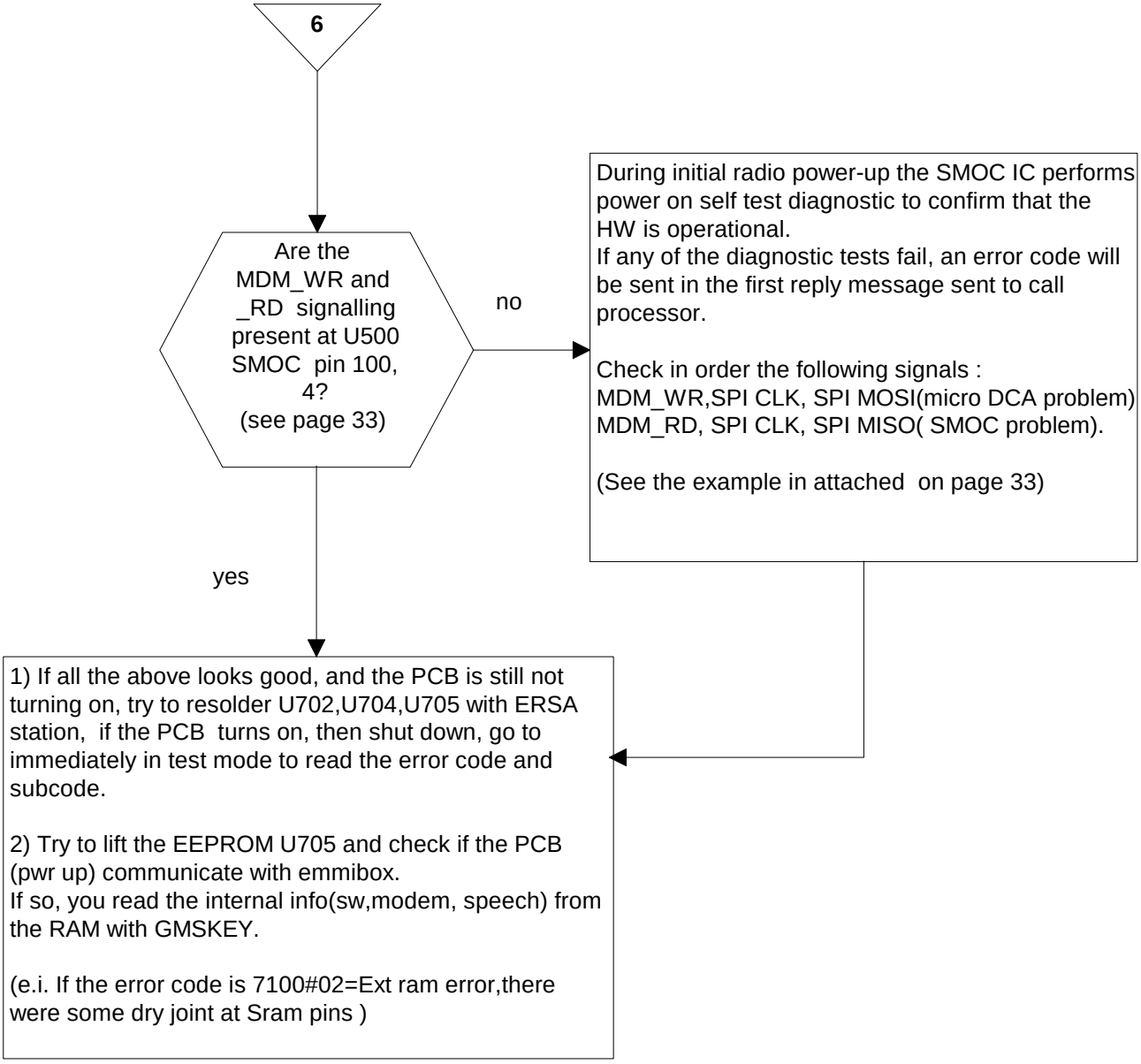
no

Check U900 GCAP and NOTE 1

3


3
Is 13MHz master clk present at U703 BIC pin 17? (see page 32)
no
Check in order Y201, CR201, U201 and NOTE 1
yes
Is 13MHz master clk present at U703 BIC pin 37 (see page 32)
no
See the 13MHz path logic block diagram
yes
Is 2.75V present at pull up resistors terminals R702-706-701
no
Check the resistors and note 1
yes
Does TP4 reset line go high and Is the reset sequence ok? (see page 23)
no
Check L275 at pull up resistor R920 terminals.
If the reset is about 200mV lifted in order the following pin:
1) GCAP pin 30 (it's likely to faulty IC)
2) SMOC pin 98
3) BIC pin 35
4) J101 display conn.
If the reset line is alays low send the PCB in HTC
Quick Check: (pull Watch Dog high)
Reset line :- One steady pulse , Bad boot code, problem between Micrpocessor and the software.
Steady
- One flashing pulse , Unsolder on software or Microprocessor.
Flashing
- Two staedy pulse : some other device is causing the problem.
Steady
- Two pulse with the 2nd one flashing : Bad Ram or bad software.
Flashing
yes
4


4
Is CE signalling(one clk cycle 1/13MHz=77nS) present at TP11 U702 Falshprom? (see page 32)
no
Check U702 and NOTE 1. If there isn' t L275 voltage send the PCB to HTC
yes
Is CE signalling present at U703 BIC pin 19?
no
Micro DCA or U702 problem. If there isn' t L275 voltage send the PCB to HTC
yes
Are the signal below present at U705 EEPROM?
1) pin 7 L275 opereting voltage
2)pin 27 CE (active low) see page 33
3) pin 6 WR (active low)
4) pin 1 OE (active low)
5) Access time 300nS
no
Check U704 and NOTE 1. If there isn' t L275 voltage send the PCB to HTC
yes
Is DATA BUS D0:D15 logic signalling correct? (e.i. Quick check at U705 EEPROM pin 26 D15, see page 33)
no
You can usually have twice problems:
1) BUS Conflict (when two peripheral stay in low impedence in the same time)
2) The wrong Falling Edge transition CMOS level (See the example in attached on page 21-22)
3) Check the J101display connector for any short circuit.
yes
5


6
Are the MDM_WR and _RD signalling present at U500 SMOC pin 100, 4?
(see page 33)
no
During initial radio power-up the SMOC IC performs power on self test diagnostic to confirm that the HW is operational.
If any of the diagnostic tests fail, an error code will be sent in the first reply message sent to call processor.
Check in order the following signals :
MDM_WR,SPI CLK, SPI MOSI(micro DCA problem)
MDM_RD, SPI CLK, SPI MISO(SMOC problem).
(See the example in attached on page 33)
yes
1) If all the above looks good, and the PCB is still not turning on, try to resolder U702,U704,U705 with ERSA station, if the PCB turns on, then shut down, go to immediately in test mode to read the error code and subcode.
2) Try to lift the EEPROM U705 and check if the PCB (pwr up) communicate with emmibox.
If so, you read the internal info(sw,modem, speech) from the RAM with GMSKEY.
(e.i. If the error code is 7100#02=Ext ram error,there were some dry joint at Sram pins)

Supplement 7
PCB only
No keypad operation

START

Is 2.75V voltage present at S3 buttom volume pin2

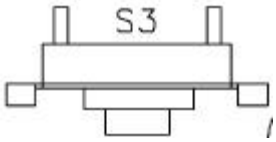
yes

It is likely that there is a short circuit under the J101 and NOTE 1

no

no

pin 2

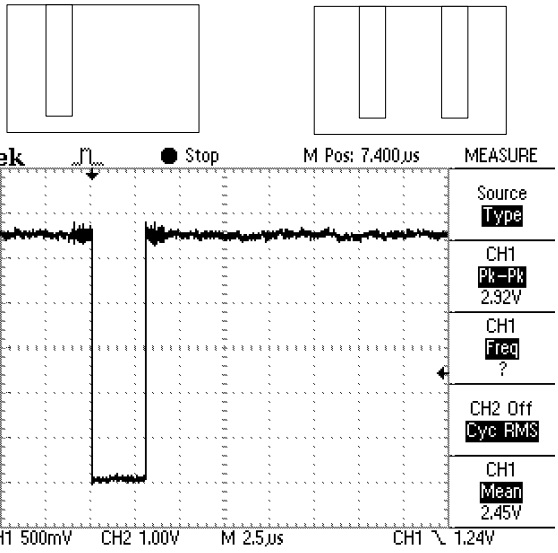


Press the buttom volume (don't realese it)

Is present now one pulse low at S3 pin 2

no

If there are two pulses low there is a short circuit under J101 and NOTE 1



yes

Release the buttom volume

Is still present one pulse low or 2.75V voltage only at S3 pin 2

yes

Check J101NOTE1 after Sent to HTC
It's likely to DCA micro problem

no

Check J101 and NOTE 1

Supplement 8
PCB only
No rx

1) Innject into ext.antenna port of the PCB a 947.4MHz signal at -20dBm
2) With the PCB in test mode press the following keys sequence 45062#
3) Use the PCB TEST to comparison
4) **ATTENTION** : The mesaures of the signal can be change with differents PROBES and CABLES.

START

Remenber to check ANT. SW. components for bad positoined or missing:
CR432 diode pin, R1128, C1043
Poor RX= reduce the battery stand by

Does the BER, RX_Quality -Level fail on CH1-62-124?

no

Attention:
The root cause could be the strong interferencies due to the closeness to the BS (base station) .

yes

Is the IF signal 215MHz -8dBm ok at L401 terminal (see page 36)

no

Go to A page11

yes

Are the signals ok RXI,RXQ at U201 pin 46,48

no

Is the signal IQREF 1.38V at U201pin 47

no

Check U500 pin 21 and NOTE 1

yes

Is the signal ok at L.O.430MHz at U201 pin 40 (see page 36)

no

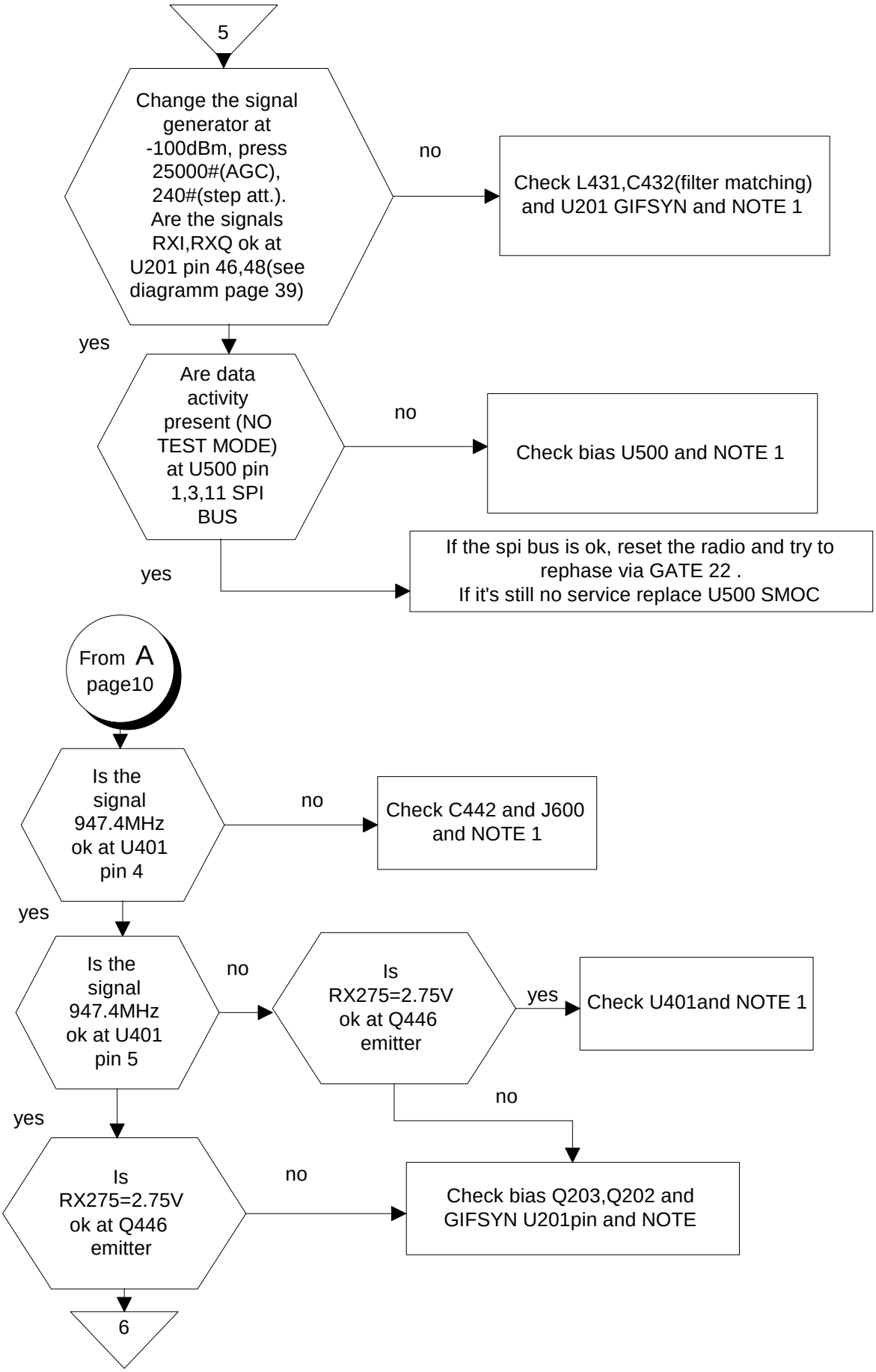
Check U201(pin 43=2.25V) CR431.L433 and NOTE 1.

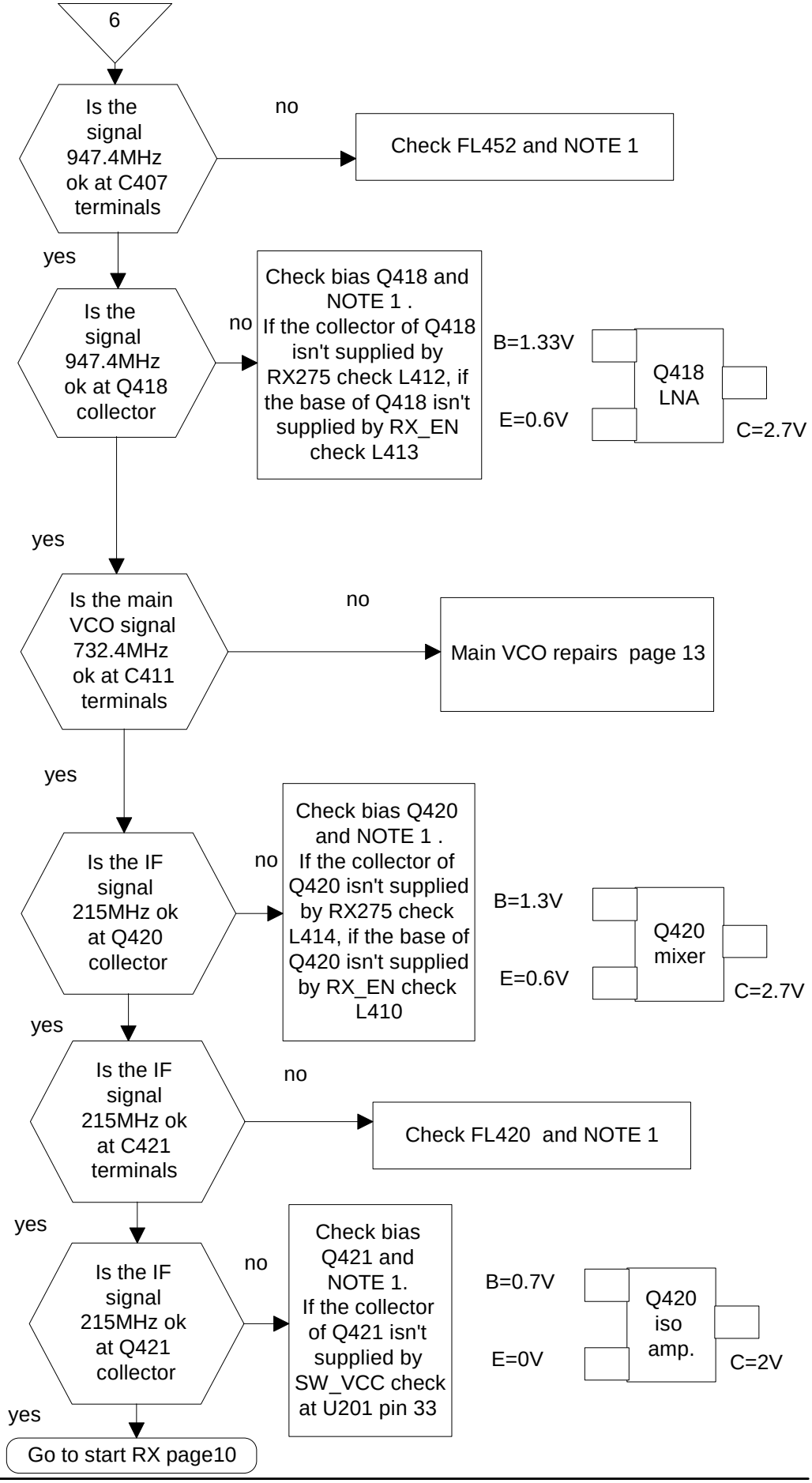
yes

Check bias Q203,Q202, GIFSYN U201 and NOTE 1.

yes

5


5
Change the signal generator at -100dBm, press 25000#(AGC), 240#(step att.). Are the signals RXI,RXQ ok at U201 pin 46,48(see diagramm page 39)
no
Check L431,C432(filter matching) and U201 GIFSYN and NOTE 1
yes
Are data activity present (NO TEST MODE) at U500 pin 1,3,11 SPI BUS
no
Check bias U500 and NOTE 1
yes
If the spi bus is ok, reset the radio and try to rephase via GATE 22 .
If it's still no service replace U500 SMOC
From A page10
Is the signal 947.4MHz ok at U401 pin 4
no
Check C442 and J600 and NOTE 1
yes
Is the signal 947.4MHz ok at U401 pin 5
no
Is RX275=2.75V ok at Q446 emitter
yes
Check U401and NOTE 1
no
yes
Is RX275=2.75V ok at Q446 emitter
no
Check bias Q203,Q202 and GIFSYN U201pin and NOTE
6


6
Is the signal 947.4MHz ok at C407 terminals
no
Check FL452 and NOTE 1
yes
Is the signal 947.4MHz ok at Q418 collector
no
Check bias Q418 and NOTE 1 . If the collector of Q418 isn't supplied by RX275 check L412, if the base of Q418 isn't supplied by RX_EN check L413
B=1.33V
E=0.6V
Q418 LNA
C=2.7V
yes
Is the main VCO signal 732.4MHz ok at C411 terminals
no
Main VCO repairs page 13
yes
Is the IF signal 215MHz ok at Q420 collector
no
Check bias Q420 and NOTE 1 . If the collector of Q420 isn't supplied by RX275 check L414, if the base of Q420 isn't supplied by RX_EN check L410
B=1.3V
E=0.6V
Q420 mixer
C=2.7V
yes
Is the IF signal 215MHz ok at C421 terminals
no
Check FL420 and NOTE 1
yes
Is the IF signal 215MHz ok at Q421 collector
no
Check bias Q421 and NOTE 1. If the collector of Q421 isn't supplied by SW_VCC check at U201 pin 33
B=0.7V
E=0V
Q420 iso amp.
C=2V
yes
Go to start RX page10

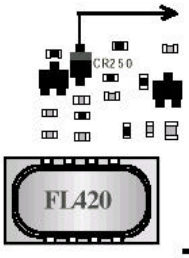
Main VCO repair

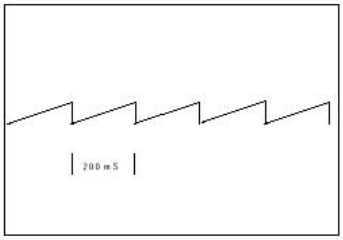
START

Is superfilter voltage 2.55V ok at U201 pin 21

no

Check C211,C212,Vref=2.75V,Q202,Q203,R475=4.75V at U201 pin 11,44 and NOTE 1





The radio search 124 channel by changing the RX VCO voltage.

Ch 124 (2.8 - 3 V)
ch 001 (2- 2.6 V)

OSC. SCOPE

yes

Is charge pump voltage 2.38V at U201 pin 23

no

1)Check the CP_OUT voltage range at GIFSYN pin 23.
CH001= about 2.19V
CH062= about 2.64V
CH124= about 3.08V
2) If the voltage is alawys low check C208,C237 and after resolder the Main VCO.
3) If the voltage is always high(CH1,062,124) try to resolder the Main VCO if the problem still the same could be the coil layer.

yes

Is prsc_in voltage 1.4V at U201 pin 26

no

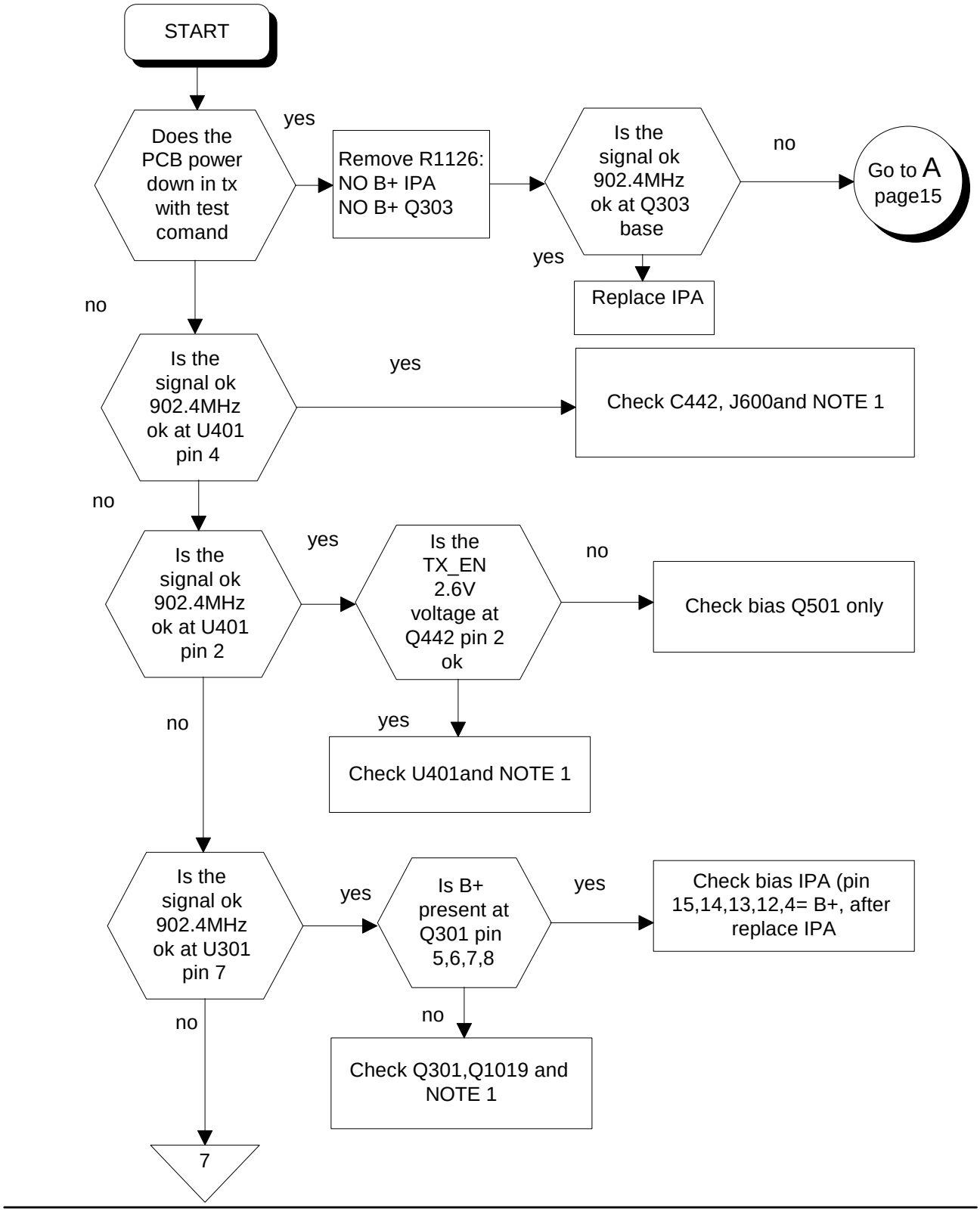
Check U201 and NOTE 1

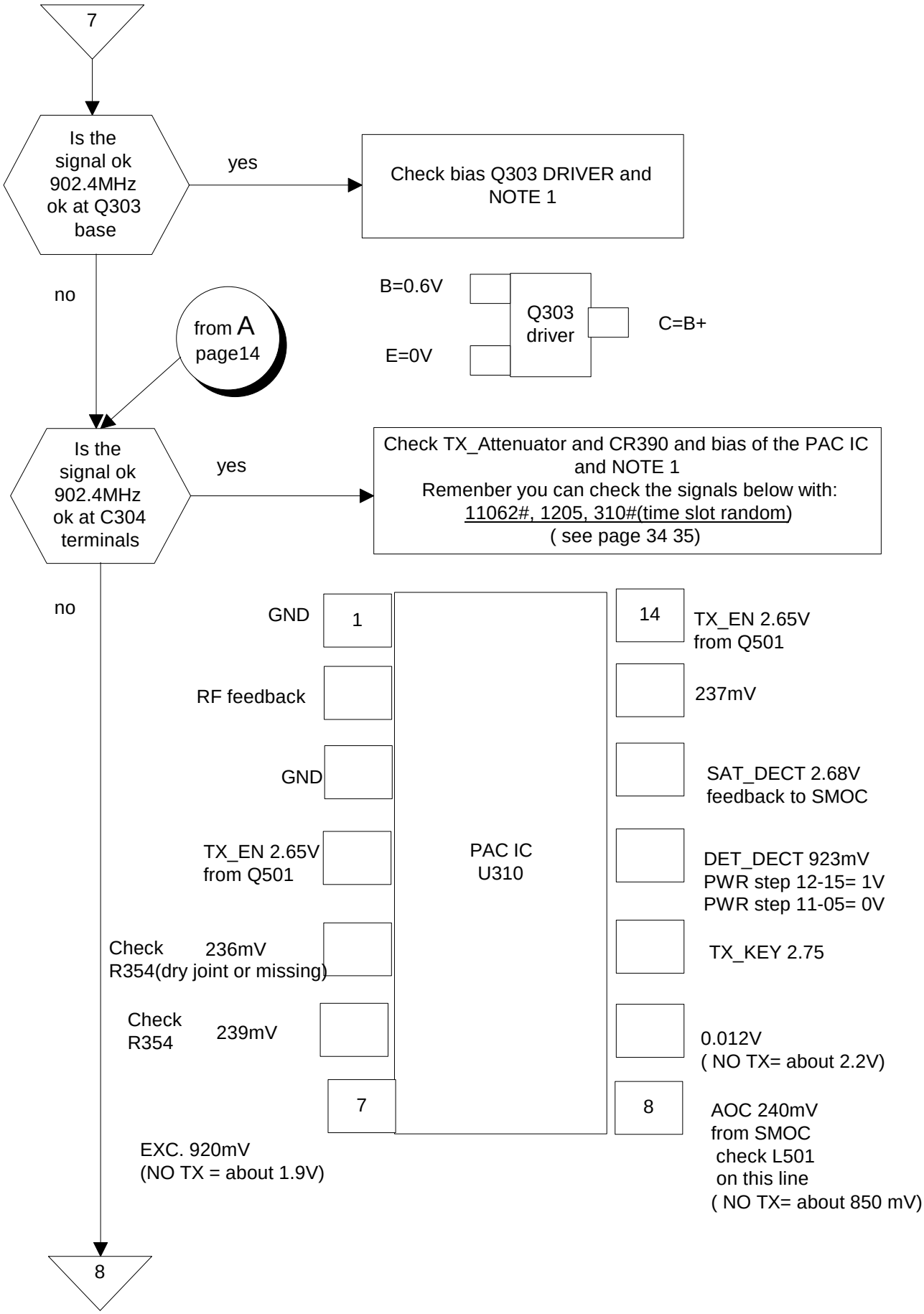
yes

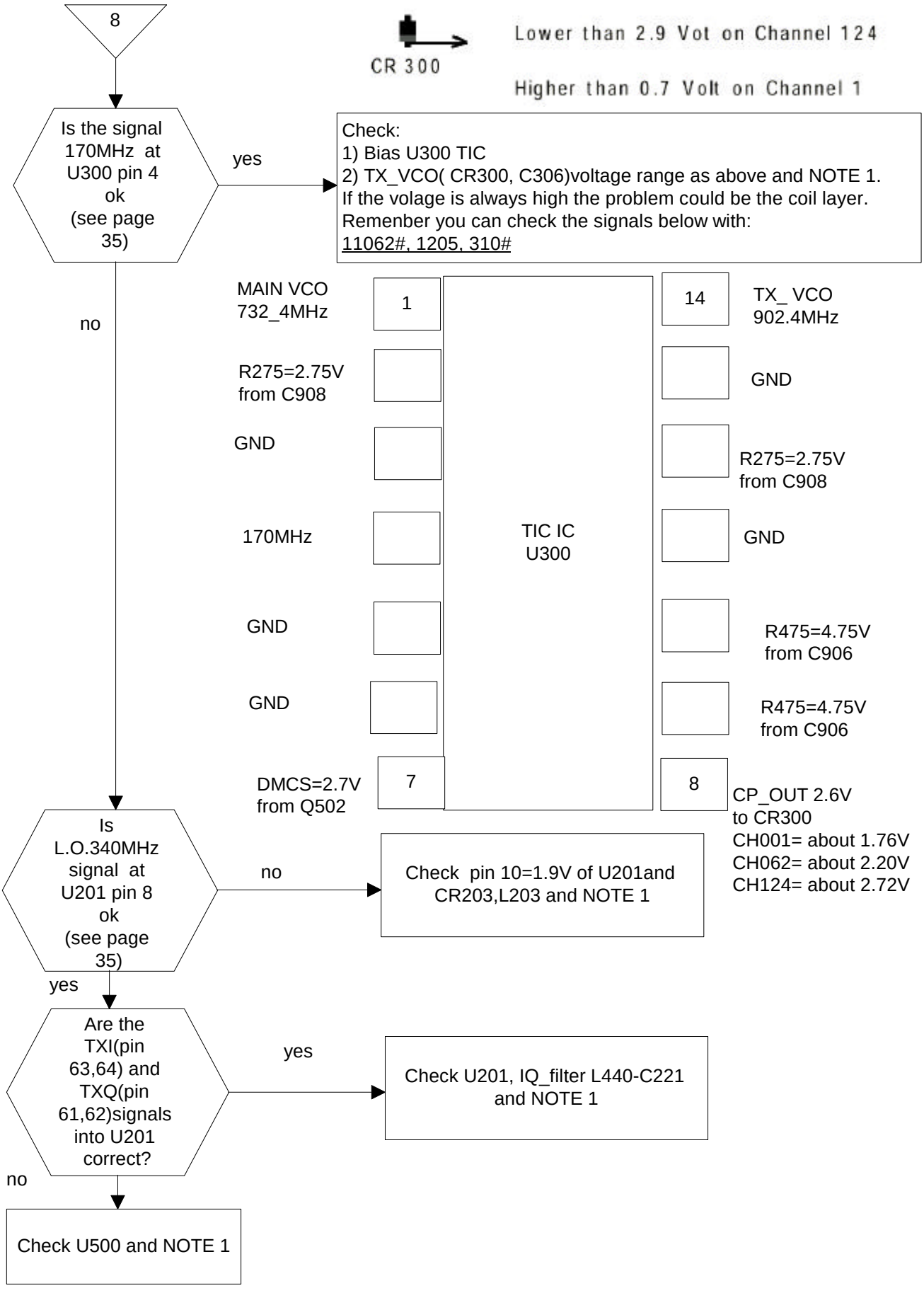
Resolder Main VCO

supplement 9
PCB only
No tx

With the PCB in test mode press the following keys sequence:
11062# CH or 110062#CH PHASE II,1215#PWR CONTINUOS,40#SENDING ONLY 1
See page 37


START
Does the PCB power down in tx with test comand
yes
Remove R1126: NO B+ IPA NO B+ Q303
Is the signal ok 902.4MHz ok at Q303 base
no
Go to A page15
yes
Replace IPA
no
Is the signal ok 902.4MHz ok at U401 pin 4
yes
Check C442, J600and NOTE 1
no
Is the signal ok 902.4MHz ok at U401 pin 2
yes
Is the TX_EN 2.6V voltage at Q442 pin 2 ok
no
Check bias Q501 only
yes
Check U401and NOTE 1
no
Is the signal ok 902.4MHz ok at U301 pin 7
yes
Is B+ present at Q301 pin 5,6,7,8
yes
Check bias IPA (pin 15,14,13,12,4= B+, after replace IPA
no
Check Q301,Q1019 and NOTE 1
no
7


7
Is the signal ok 902.4MHz ok at Q303 base
yes
Check bias Q303 DRIVER and NOTE 1
no
from A page14
B=0.6V
E=0V
Q303 driver
C=B+
Is the signal ok 902.4MHz ok at C304 terminals
yes
Check TX_Attenuator and CR390 and bias of the PAC IC and NOTE 1
Remenber you can check the signals below with:
11062#, 1205, 310#(time slot random)
(see page 34 35)
no
GND
1
RF feedback
GND
TX_EN 2.65V from Q501
Check R354(dry joint or missing)
236mV
Check R354
239mV
7
EXC. 920mV
(NO TX = about 1.9V)
PAC IC U310
14
TX_EN 2.65V from Q501
237mV
SAT_DECT 2.68V feedback to SMOC
DET_DECT 923mV
PWR step 12-15= 1V
PWR step 11-05= 0V
TX_KEY 2.75
0.012V
(NO TX= about 2.2V)
8
AOC 240mV from SMOC check L501 on this line
(NO TX= about 850 mV)
8

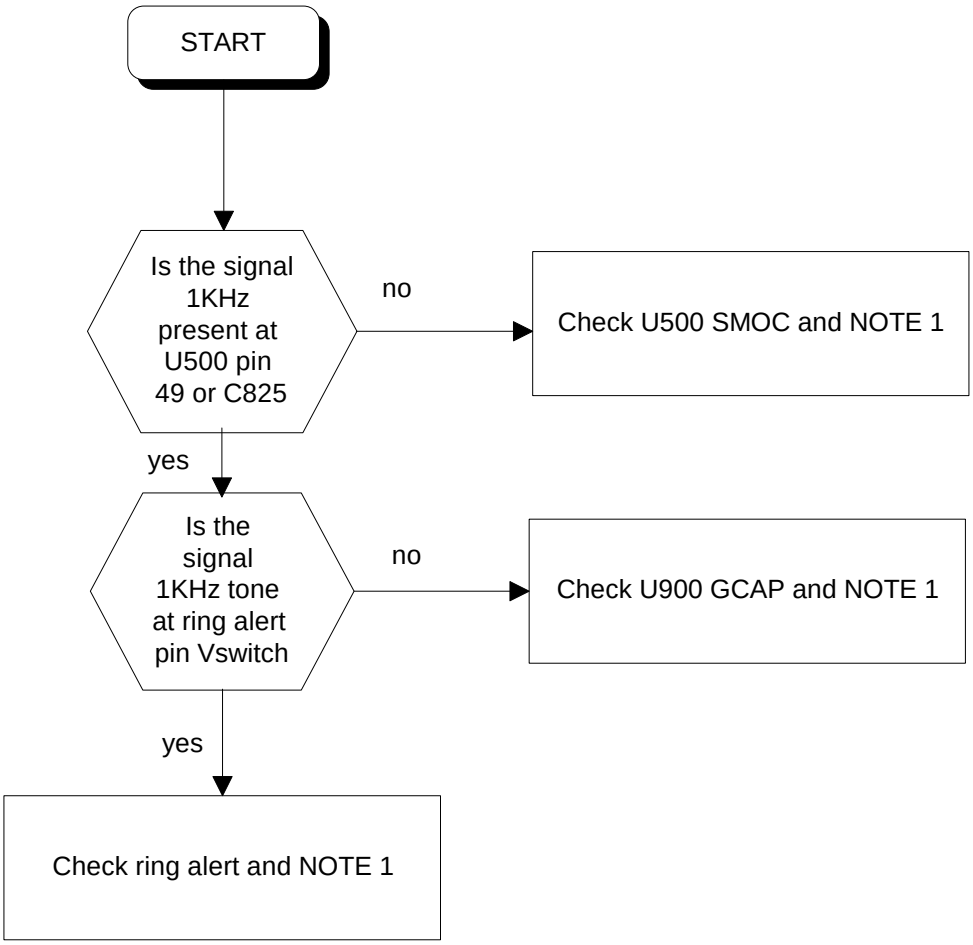

8
CR 300
Lower than 2.9 Vot on Channel 124
Higher than 0.7 Volt on Channel 1
Is the signal 170MHz at U300 pin 4 ok (see page 35)
yes
Check:
1) Bias U300 TIC
2) TX_VCO(CR300, C306)voltage range as above and NOTE 1.
If the volage is always high the problem could be the coil layer.
Remenber you can check the signals below with:
11062#, 1205, 310#
no
MAIN VCO 732_4MHz
1
R275=2.75V from C908
GND
170MHz
GND
GND
DMCS=2.7V from Q502
7
TIC IC U300
14
TX_ VCO 902.4MHz
GND
R275=2.75V from C908
GND
R475=4.75V from C906
R475=4.75V from C906
8
CP_OUT 2.6V to CR300
CH001= about 1.76V
CH062= about 2.20V
CH124= about 2.72V
Is L.O.340MHz signal at U201 pin 8 ok (see page 35)
no
Check pin 10=1.9V of U201and CR203,L203 and NOTE 1
yes
Are the TXI(pin 63,64) and TXQ(pin 61,62)signals into U201 correct?
yes
Check U201, IQ_filter L440-C221 and NOTE 1
no
Check U500 and NOTE 1

supplement 10
led service

Use the following test command:
ATTENTION: the reed switch must be closed (with a magnetic)
541# Turn on the RED led
542# Turn on the GREEN led
543# Turn on the orange leds
540# Turn off any leds
Check Q903,Q904, R909,R908 for dry joints or missing resistors only

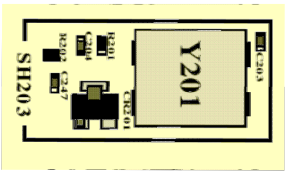
supplement 11
PCB only
No/low ring alert

With the PCB in test mode press the following keys seguence:
432# tone into ring alert
481000# 1KHz tone
4707# volume
or
1539# ring alert


START
Is the signal 1KHz present at U500 pin 49 or C825
no
Check U500 SMOC and NOTE 1
yes
Is the signal 1KHz tone at ring alert pin Vswitch
no
Check U900 GCAP and NOTE 1
yes
Check ring alert and NOTE 1

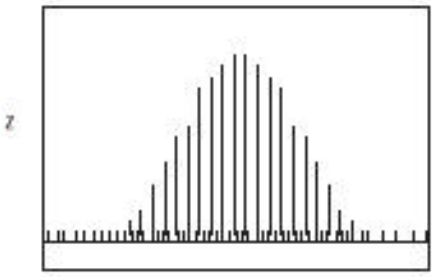
supplement 12
PCB only
Freq. error out spec.

Replace in order Y201 Main cristal, CR201 varicap
Remenber: you can check the AFC DAC line range with the test comand 260000# 568mV 264095# 2.6V at U500 SMOC pin 38 or 11062#CH 26xxxx# 0000-4095 AFC 1215#PW 41#sending 1(no work Krunch platform) o 40#sending 0)

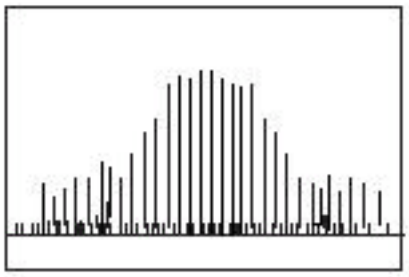


supplement 12
NO AFC - NO TX GATE 22

Check the shape of GSMK (Gaussian Minimum Shift Keying)
11062# CH
1205# MAX PW
310# TIME SLOT RANDOM



GOOD MODULATION



BAD MODULATION

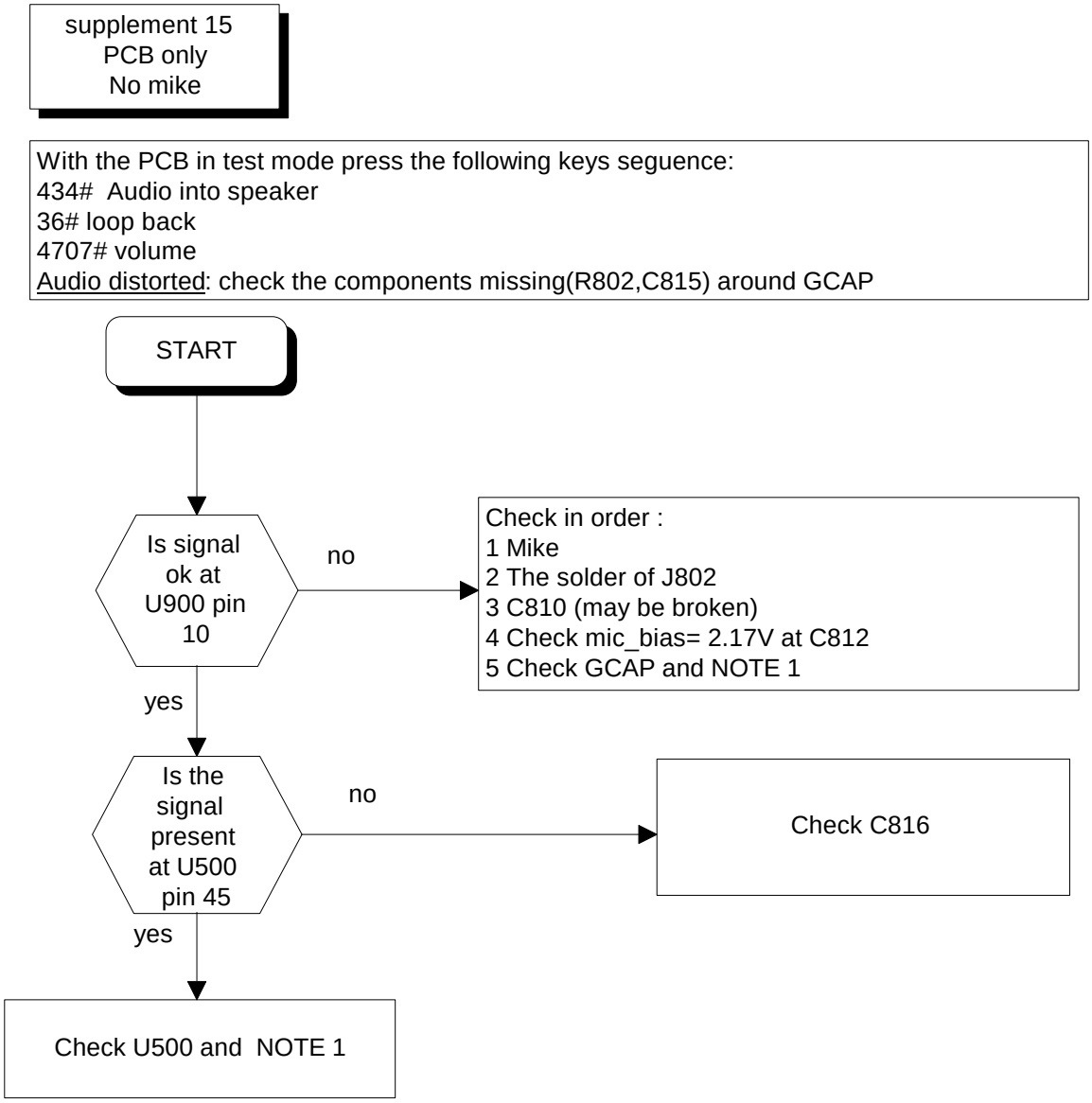
Possibile root cause:
1) Bad TX_VCO spurios(dry joint, bad coil layer)

2) Bad R475 voltage(C906 broken, bad polarity, unsoldered)

3) Bad R275 voltage(C908 broken, unsolder)

4) Bad DM_CS from Q502(bad bias, track damage)

5) Bad Q303 amplifier(bad bias, bad coil layer)


supplement 15
PCB only
No mike
With the PCB in test mode press the following keys seguence:
434# Audio into speaker
36# loop back
4707# volume
Audio distorted: check the components missing(R802,C815) around GCAP
START
Is signal ok at U900 pin 10
no
Check in order :
1 Mike
2 The solder of J802
3 C810 (may be broken)
4 Check mic_bias= 2.17V at C812
5 Check GCAP and NOTE 1
yes
Is the signal present at U500 pin 45
no
Check C816
yes
Check U500 and NOTE 1

supplement 16
PCB only
No/low audio

START

Is the audio present at J600 pin 9 Audio_out(press volume buttom)?

yes

Check DW_link Bus(sense level of ext. accessory) at J600 pin 12:
1) None 4.55V (if it's low 4.2-4V check DW_link line, possibile faulty comp. C762 0.010uF)
2) Headset 1.5V OK

no

Is the DW_LINK voltage 4.55V present at J600 pin 12?

no

yes

With the PCB in **TEST MODE** press the following keys seguence:
434# tone into speaker
or
430# tone handsfree external speaker, mike - analog audio(J600)
481000# 1KHz tone
4707# volume
Audio distorted: check the components missing(R802,C815) around GCAP

Is the signal 1KHz present at U500 pin 49

no

Check the voltage VAG-ref 1.38V at C1030 - C560
Check U500 SMOC and NOTE 1

yes

Is signal 1KHz tone present at J601pin7,8

no

Check U900 GCAP and NOTE 1

yes

Check the FLEX of the flip

from U500 SMOC to GCAP

AUD_EN1	AUD_EN2	EAR-PIECE	ALERT	MIC	EXT AUD
LOW	LOW	OFF	OFF	OFF	OFF
LOW	HIGH	ON	OFF	ON	OFF
HIGH	LOW	OFF	ON	ON	OFF
HIGH	HIGH	OFF	OFF	OFF	ON

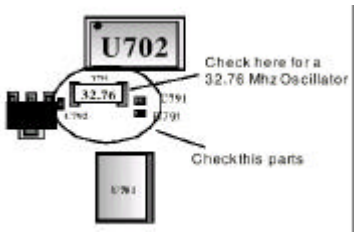
supplement 18
Incorrect low batt.indication

Quick check

Staus phone	Supply(V)	Batt.icon	Root case	Remedy
Pwr up	Main batt. discharger	Always full charger indicator	The thermistor is not connect	Check therm. Line

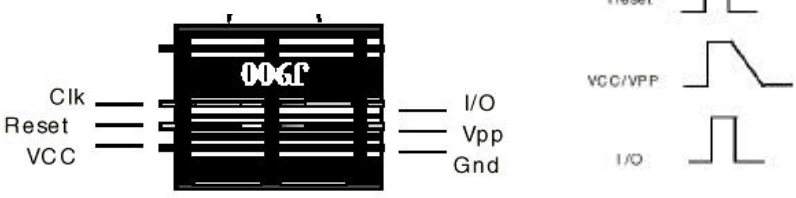
Check in order:
1) Flex the radio via Emmictrl or or master card
2) Rephase the Main battery and Aux batt. via GATE 22
3) Use the dummy battery to check the battery indicator
4) If the problem remains check U703(reliable IC) and NOTE 1
5) Check the ANT.SW. components(CR432, R1128, C1043) for missing bad positioned(Poor Rx)
6) Check the Cell Broadcast -Frequency of Serch (Reduce the stand by battery).
7) Check for no B+ contact shorting to vibrator.
8) Does the phone draw current when is off?

supplement 20
RTC



Check in order:
1) In test mode press 88# (display current time and date) after repress 88# and check if the seconds are increase
2) Ckeck the flip flex
3) If the problem remains check Y701 32KHz xtal and NOTE 1

supplement 21
SIM card



Check in order:
1) The SIM card J900 unsolder or bent pins.
2) The present detect switch by shorting the pin 1, 8 of the J900 if the display show "Check Card" the problem is the card read circuit.
3) In test mode press 38#(activate sim) and check the signal SIM_VCC 5V (from U902) , SIM_CLK 3.25MHz,SIM_I_O
4) 39# Deactivate sim

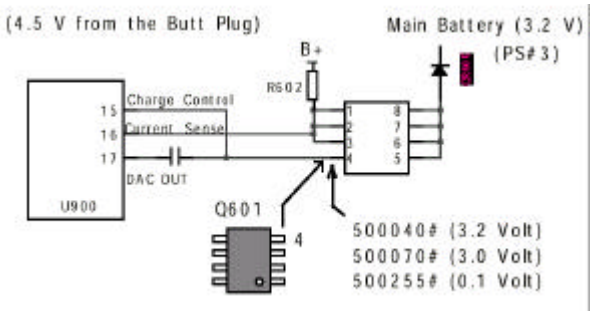
supplement 19
No/Incorrect internal battery charging

Quick check

Status phone	Supply(V)	Problem	Batt. Icon	Root case	Remedy
In charger mode	Ext.b+ Main batt.	The display doesn't show charging batt.	Not appear	The thermistor is not connected	Check therm.line
Pwr up	Ext.b+ Main batt.		Disappear	The thermistor is not connected	Check therm.line

With the PCB in test mode press the following keys:
500128# Driver internal charger MAIN BATTERY
501128# Driver internal charger AUX BATTERY
50000# OFF
If the current stay in 0 or maximum check R602

This is a 8700 example



START

Is there the voltage present at U900 pin17

no → Check U703 BIC and NOTE 1

yes

Did the voltage go low at Q601 pin 4

no → Check U900 GCAP and NOTE 1

yes

Does B+ present at Q1002 pin 1 Q1005 pin 1

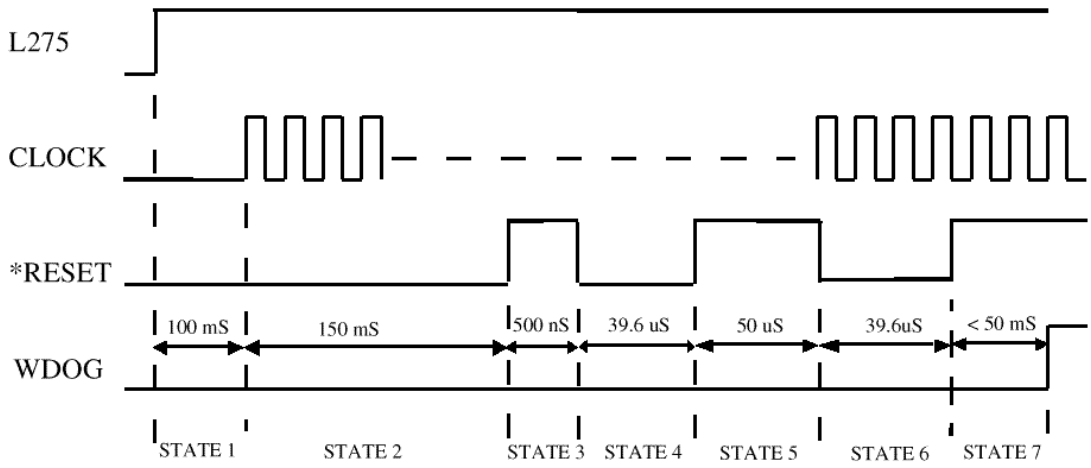
no → Check Q601,CR605 and NOTE 1

yes

See diagram of battery internal charger to debug the problems

RESET SEQUENCE AT POWER ON

The power up RESET sequence is described in the following diagram. Following the activation of the +2.75V Regulator, the GCAP LITE IC and the 68338 begin a seven state power sequence involving the *RESET line and the GCAP Lite's Watchdog input. The figure below depicts the sequence of the states. The figure is not drawn to scale.



GCAP LITE IC-RESET Timing

State 1
When the GCAP LITE IC detects a power on request (ON/OFF Line "LOW"), the GCAP LITE will drive the system *RESET line low. The 68338 Clock line will take approximately 100mS to stabilize after power is applied.

State 2
The 68338, SMoC, and BIC in the radio are connected to the *RESET line. The nominal time *RESET is held low by the GCAP LITE is 250 milliseconds +/- 50 ms.

State 3
When the GCAP LITE releases *RESET, it is pulled high by an internal resistor. There isa period of approximately 500 nanoseconds when neither the GCAP LITE or 68338 is asserting *RESET.

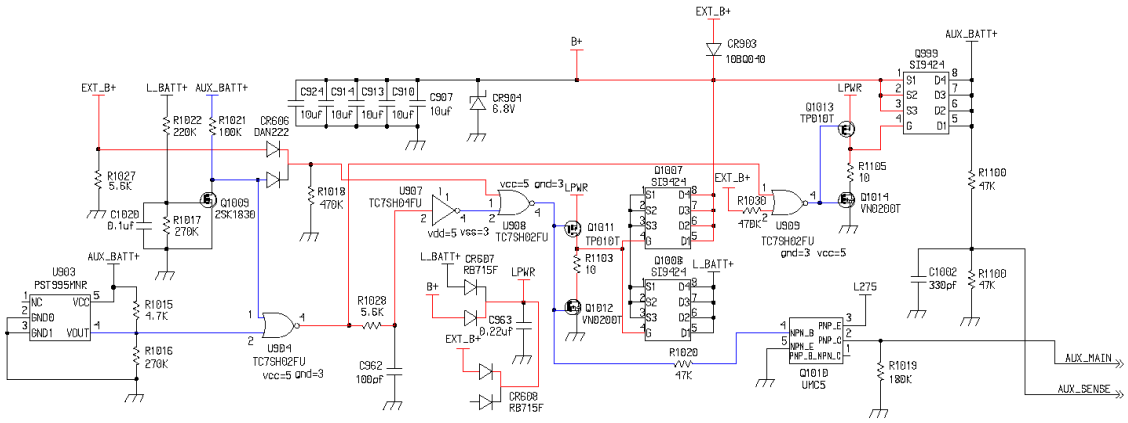
State 4
When the 68338 reset control logic detects that the system *RESET line is no longer being driven, it drives it low for an additional 512 cycles (39.6 microseconds). This assertion of *RESET by the 68338 is a feature of the IC and cannot be modified.

State 5
When the 68338 releases *RESET, it is pulled high by the internal resistor. The 68338 be-gins executing its Boot Code. If valid code is present, the RESET vector in the radio code is then executed. The Boot Code runs for about 512 cycles (39.6usec) before this new vector is executed.

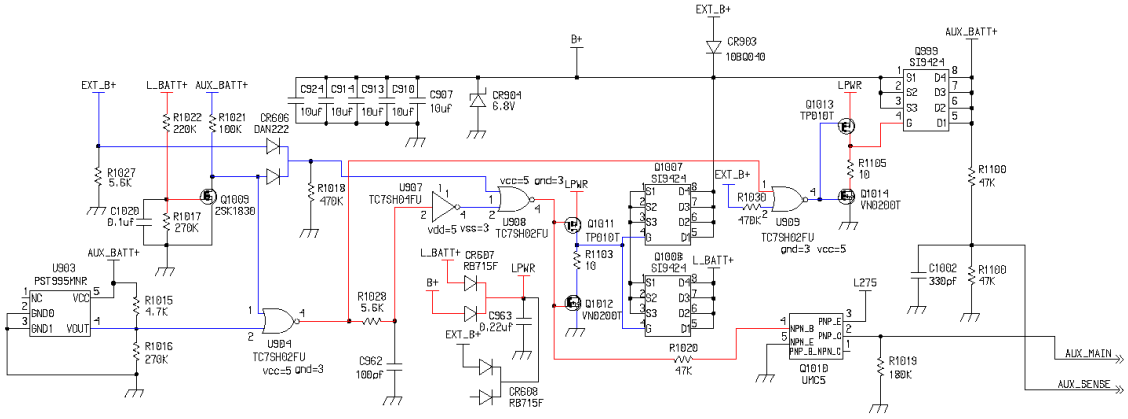
State 6
The 68338 holds *RESET low for 50usec during this state (an internally generated RE-SET).

State 7
When the 68338 releases *RESET, it is again pulled high by the internal resistor. All the processors in the system, including the 68338, then begin execution. During this state, the 68338 must drive the GCAP Lite's

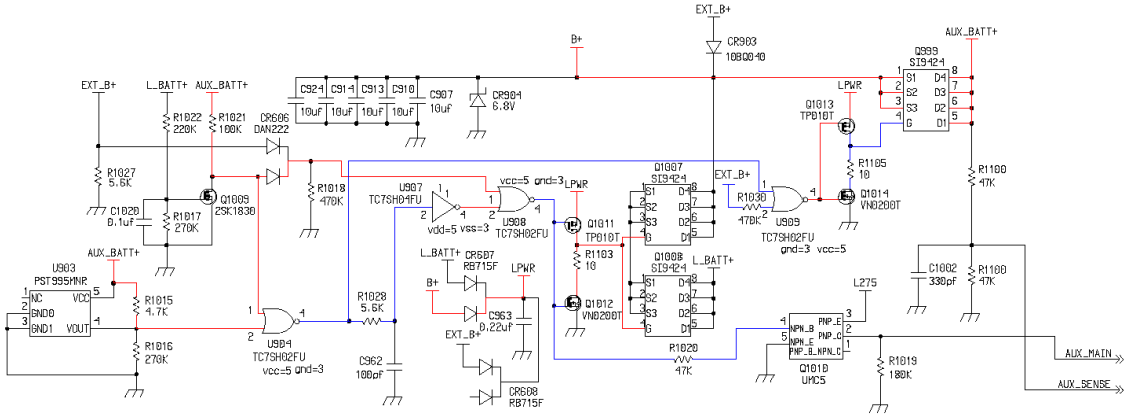
Input: **EXT_B+**



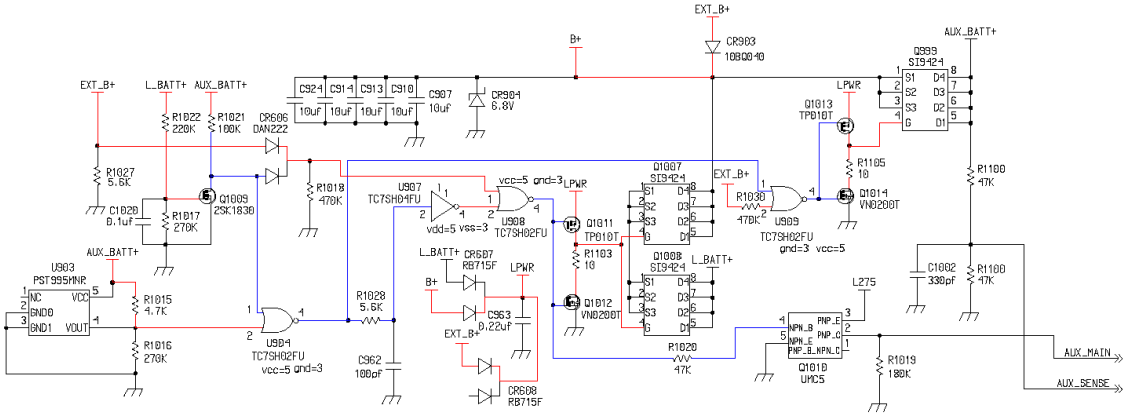
Input: **L_BATT** (main battery)



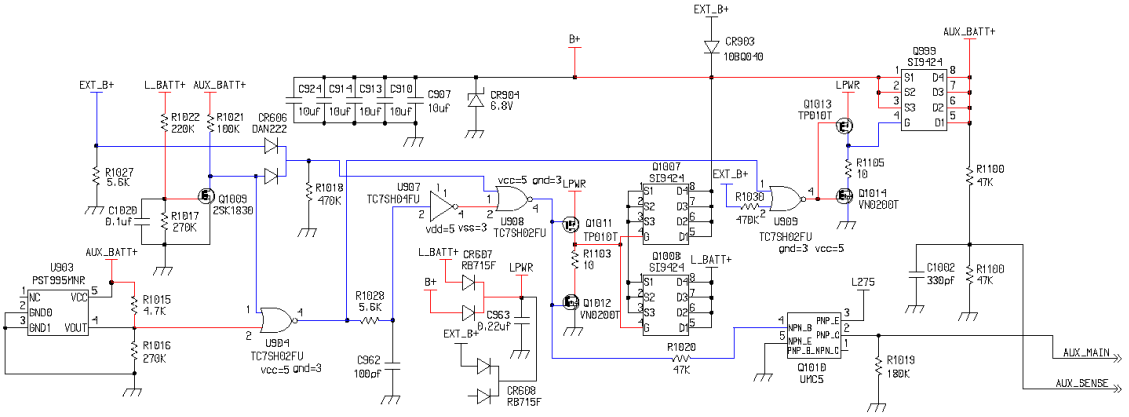
Input: **AUX_BATT** (auxiliary battery)



Input: **L_BATT + AUX_BATT + EXT_B+**



Input: **L_BATT + AUX_BATT**



supplement 22
Display internal info

In Test Mode press:

7100# = Error Code
7101# = Subcode

In Test Mode read:

01= CPU EXCPTION ERROR (upgrade last vers. sw+flex+57#)
00 =

02 = EXT. RAM ERROR (check for dry joints)

03 = MODEM ERROR
01 = BAD MODEM ID (check for dry joints 13MHz,SPI BUS)

03 = MODEM ERROR
04 = RUN TIME BAD ID

04 = MODEM ERROR (replace it)

05 = SPEECH CODER PWR FAILURE
01 = SPCH TIMED OUT

05 = SPEECH CODER PWR FAILURE
02 = SPEECH BAD ID (check for dry joints)

06 = EXEC ERROR DETECT(upgrade last vers. sw+ flex+57#)
01 = OUT OF MEMORY

07 = EEPROM ERROR(flex+57#)
01 = CHECKSUM ERROR

07 = EEPROM ERROR
02 = SUBSIDY LOCK

07 = EEPROM ERROR
03 = DALLAS PART ERROR

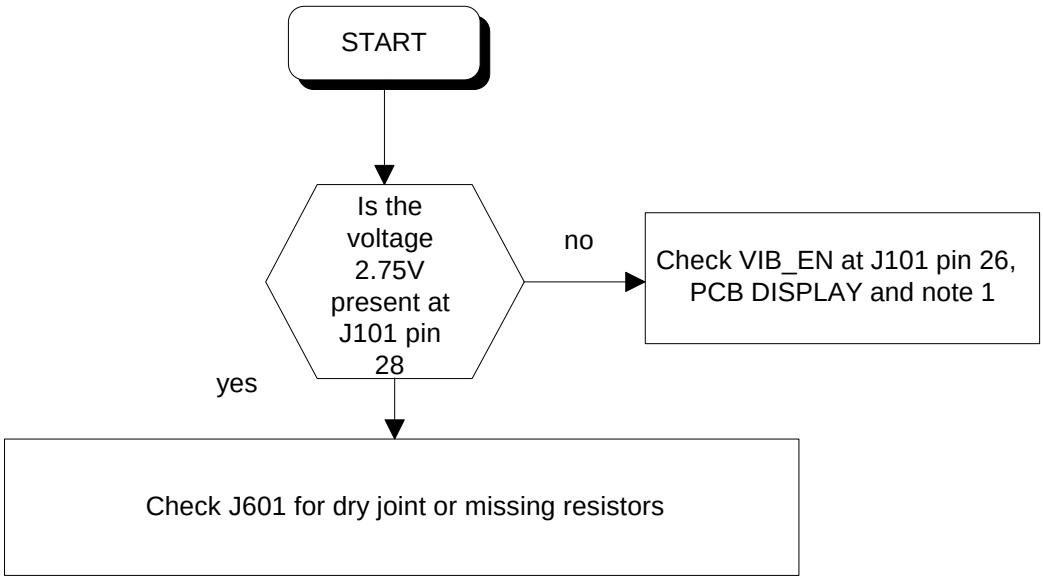
07 = EEPROM ERROR
05= SIM RESET FAILURE

08 = MMI PWR DOWN
03 = PWR BUTTOM HIT

08 = MMI PWR DOWN
04 = LOW BATTERY

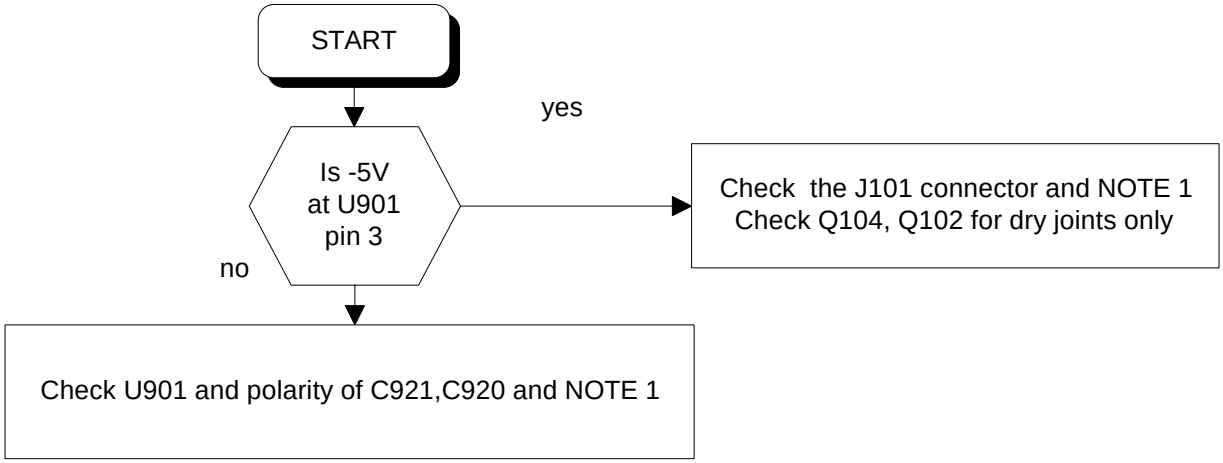
supplement 23
No/weak vibrator

In test mode press the following keys 1590# activity vibrator.
Check in order:
1 The improper assembly vibrator
2 The flip flex
3 The J601 conn. pin 9
4 Use a test pcb display(vib_driver is on pcb display)


START
Is the voltage 2.75V present at J101 pin 28
no
Check VIB_EN at J101 pin 26, PCB DISPLAY and note 1
yes
Check J601 for dry joint or missing resistors

Supplement 5
PCB only
No display

Before to start check, via emmibox with GSMKEY simulator or Emmictrl programms, the correct matching between the SW and the PCB Display (Grafic / Two Line) and reflex the PCB
Missing line use 993# turn on all pixel in display
Does the wake tone audible? If yes this means that the PCB is on and trouble is located at comunications display


START
yes
Is -5V at U901 pin 3
Check the J101 connector and NOTE 1
Check Q104, Q102 for dry joints only
no
Check U901 and polarity of C921,C920 and NOTE 1

Supplement 6
Phone fail see supplier

Go to in test mode and press 7100# to read the error code or use GSMKEY simulator or Emmictrl programms via emmibox .

Error code
05=Speech coder failure
03=Modem error
20#=00.00(no SMOC version)

Before replace the Modem verify the points below:
1 No dry joints
2 13 MHz clk input at terminals of U500 pin 40
3 RF_V1 at U500 pin 35 (from Q203)
4 All pins of U500 connect to L275
5 Verify activity at SMOC U500 SPI BUS,MDM RD WR

Error code
07=Eeprom error
Reflex the PCB via emmibox or master card, 57#.
If the problem persist send to HTC

Error code
07=Eeprom error
Subcode
03=Fail code if Dallas part PRESENT on the PCB
Place the unit in test mode and enter 57#
If the problem persist the unit is valid failure.(sent to HTC)

supplement 13
PCB only
Phase error out spec.

ATTENTION: It's necessary to reproduce the exactly conditions between the GATE 22 and yours working bench.
(e.i. Voltage power supply 3.6V ,cable loss etc..)

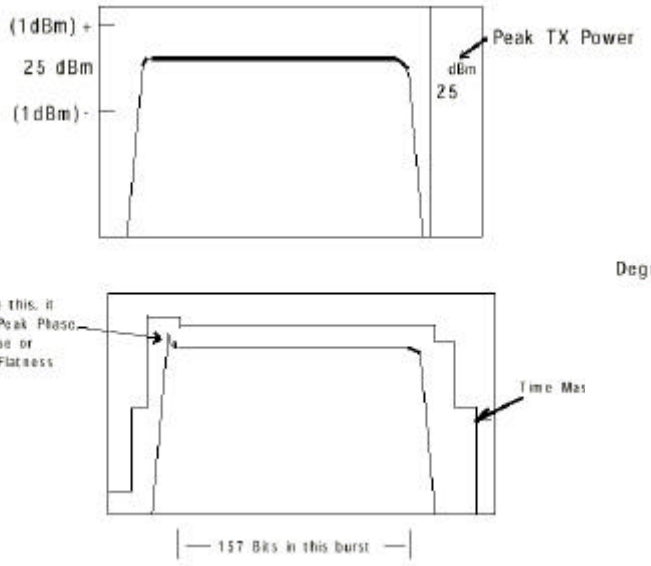
START

Answer the following questions:
1) Did the phase fail on CH001, CH062, CH124?
2) Did the phase fail at low or max PWR?
3) Did the phase fail at 4.4V or 3.5V?
4) Did the frequency error within specification?

Are the TXI(pin 63,64) and TXQ(pin 61,62)signals into U201 correct?

yes → Check U201 and NOTE 1

no → Check U500 and NOTE 1



supplement 14
Tx pwr burst out spec.

ATTENTION: It's necessary to reproduce the exactly conditions between the GATE 22 and yours working bench.
(e.i. Voltage power supply 3.6V ,cable loss etc..)

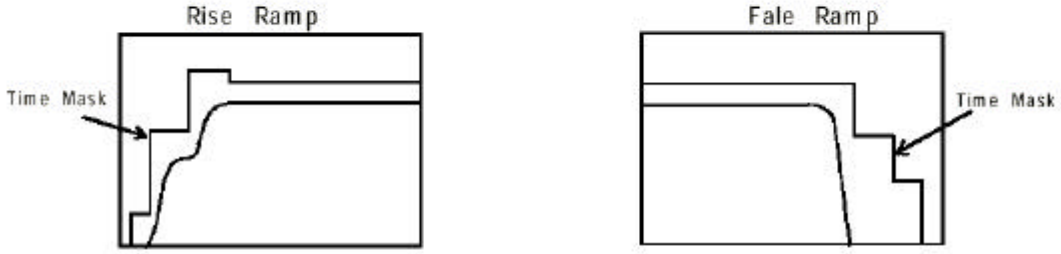
Answer the following questions:
1) Did the TMK fail on CH001, CH062, CH124?
2) Did the TMK fail at low or max PWR?
3) Did the TMK fail at 4.4V or 3.5V?
4) Did the frequency error within specification?

Before to comparison, set the cable loss to 0dBm of GATE 22, rephase the power PA DAC only and after try to do a call processing.
Compare the signals of IPA, PAC(components missing around PAC), MODEM (AOC line U310 pin 8 R501, L501) with a GOOD PCB and NOTE 1

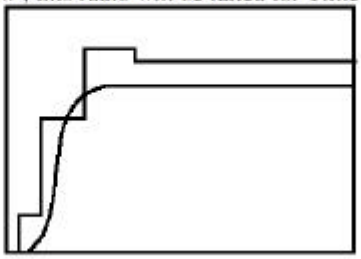
TIME MASK HIGH

When the radio transmitting , the TX burst and the AOC line from the Modem should be in the same time , when the pulse from the AOL line of the Modem earlier or later than the TX Burst , the radio will be failed for this test.

During a phone call , you can see the following wave form On HP8922
Cell Status - Pwr Ramp(Ramp Rise/Ramp False)



If the burst cross the time mask as shown below , this radio will be failed for Time Mask test.



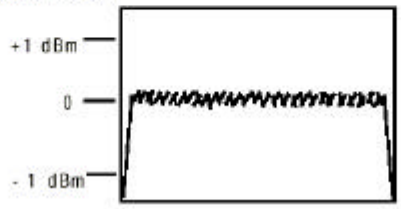
NEGATIVE FLATNESS HIGH (MID) (LOW) CH
POSITIVE FLATNESS HIGH (MID) (LOW) CH

When the radio transmitting , the TX power should not be fluxuated over + - 1 dBm , if it does ,it will fail this test.

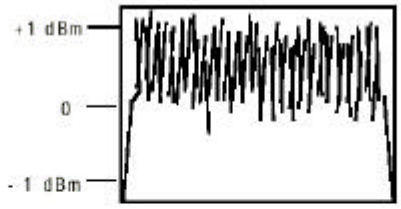
During a phone call , you can see the following wave form On HP8922

Cell Status - Pwr Ramp(Top 2 dBm):

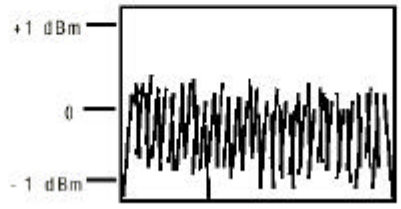
HP8922
Cell Status -> Pwr Ram (Top 2 dBm)



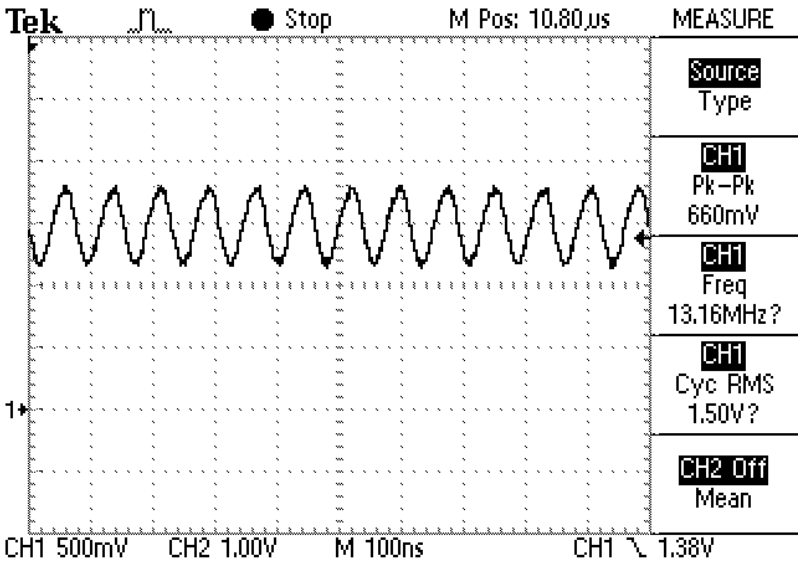
Typical wave form of a TX burst at maximum power



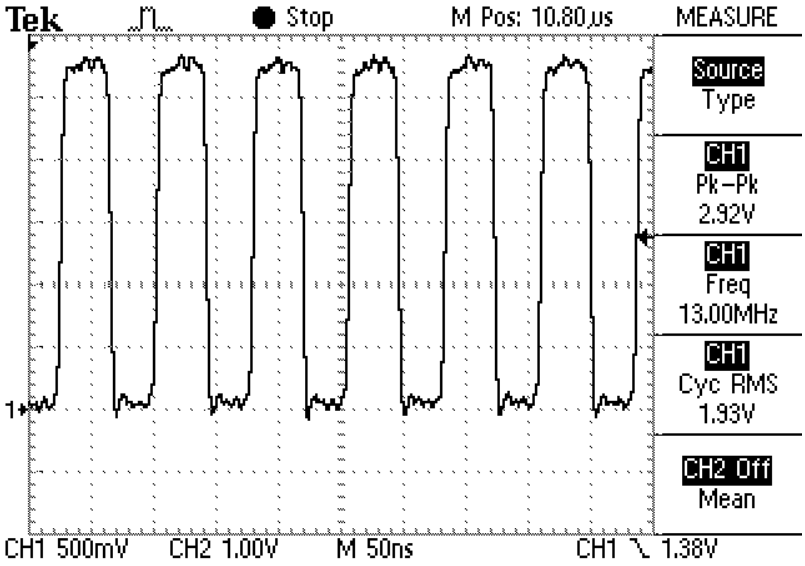
Failed for Positive Flatness
(The amplitude fluxuate higher than + 1 dBm)



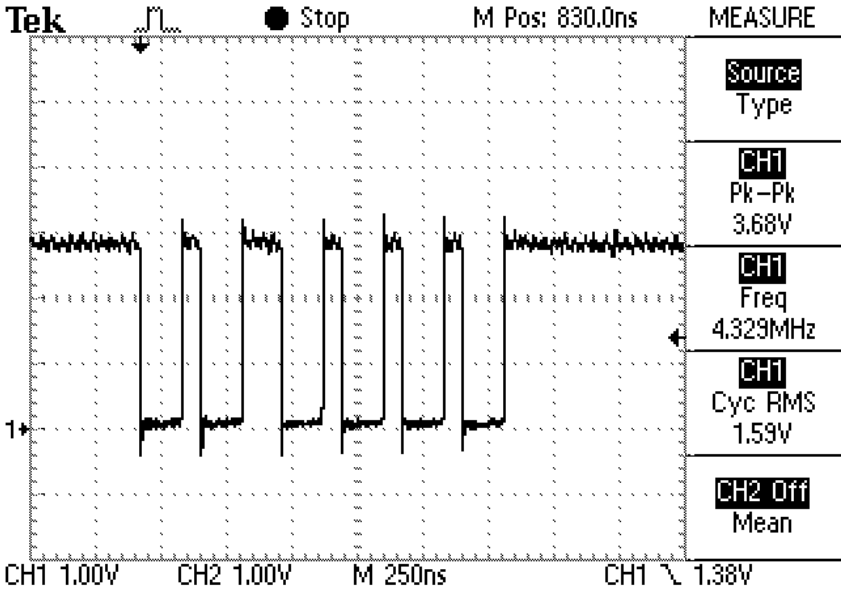
Failed for Negative Flatness
(The amplitude fluxuate lower than - 1 dBm)



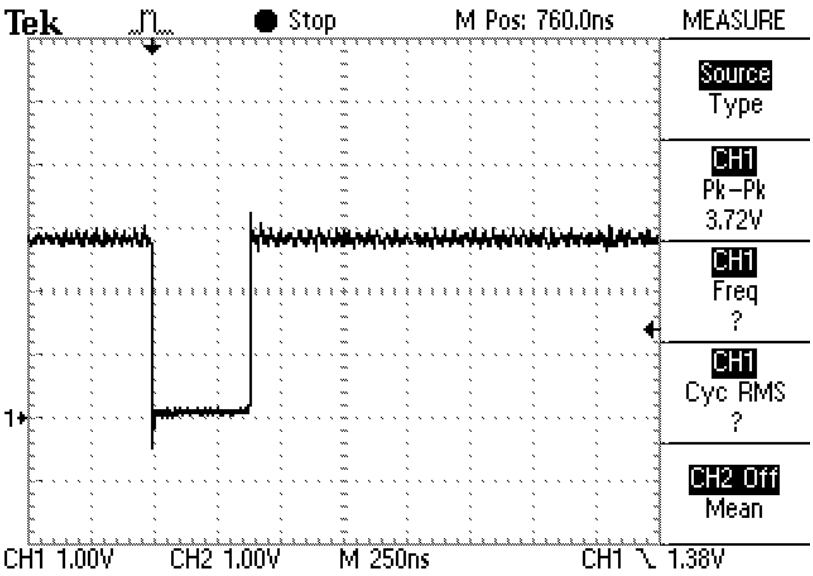
13MHz IN BIC IC pin 17



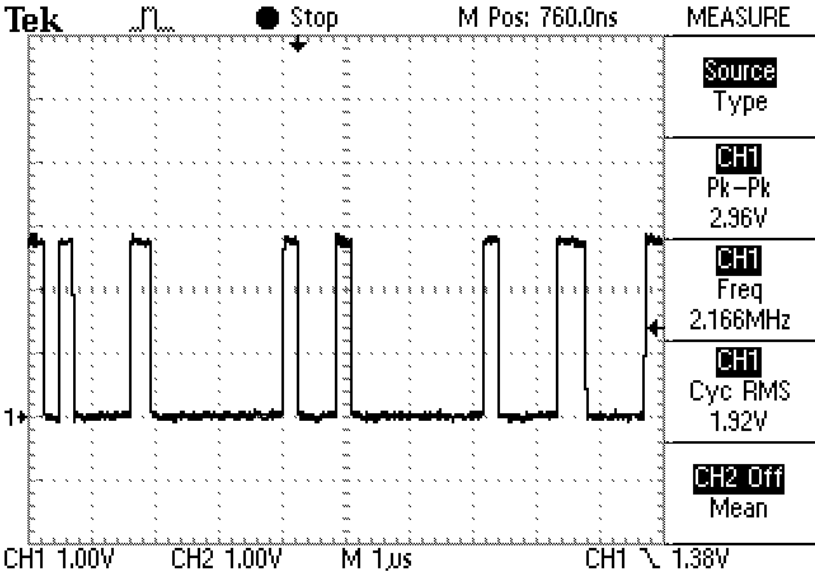
13MHz OUT BIC IC pin 37



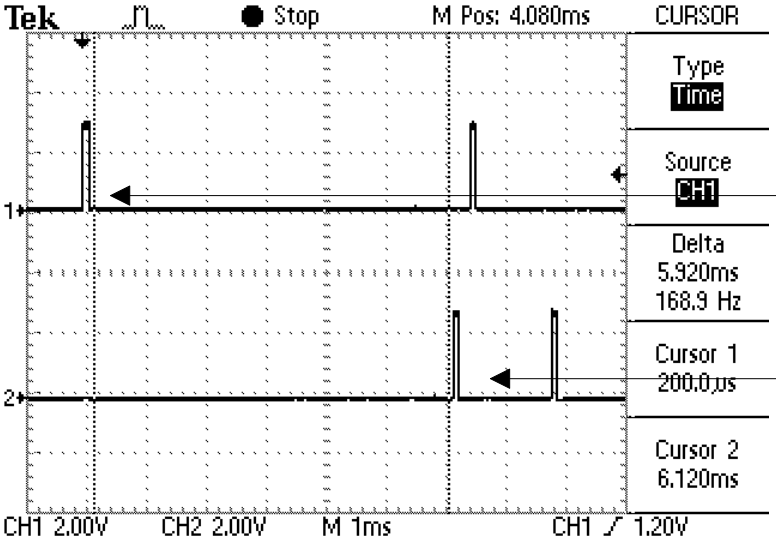
CE U702 TP11



CE U705 pin27



DATA BUS D15 U705 pin 26

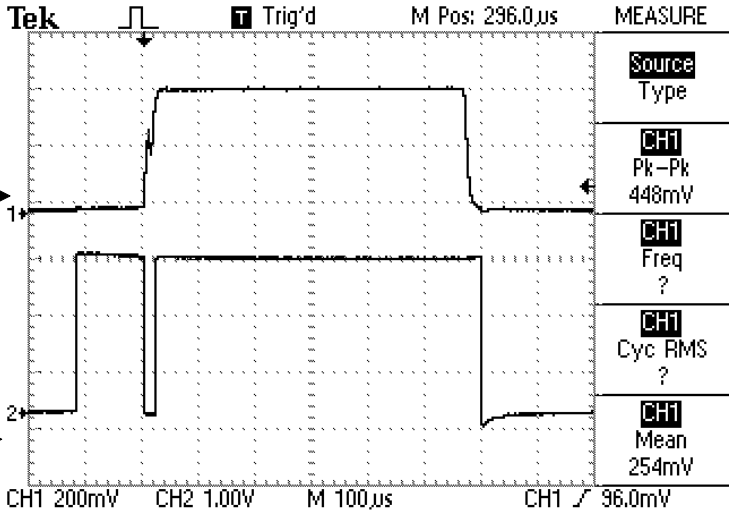


MDM_WR SMOC pin 100

MDM_RD SMOC pin 4
First reply sent to Micro

AOC PAC IC pin 8
from SMOC.
BURST

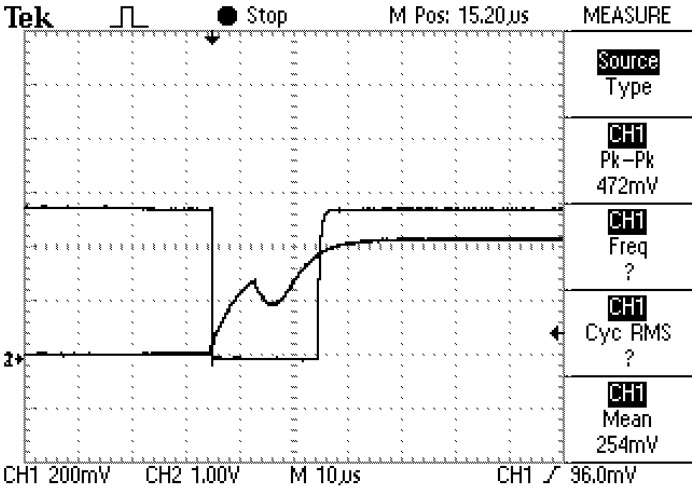
SAT_DET PAC IC pin 12
feedback to SMOC



MAX PWR STEP 05

SAT_DET(saturation detect)

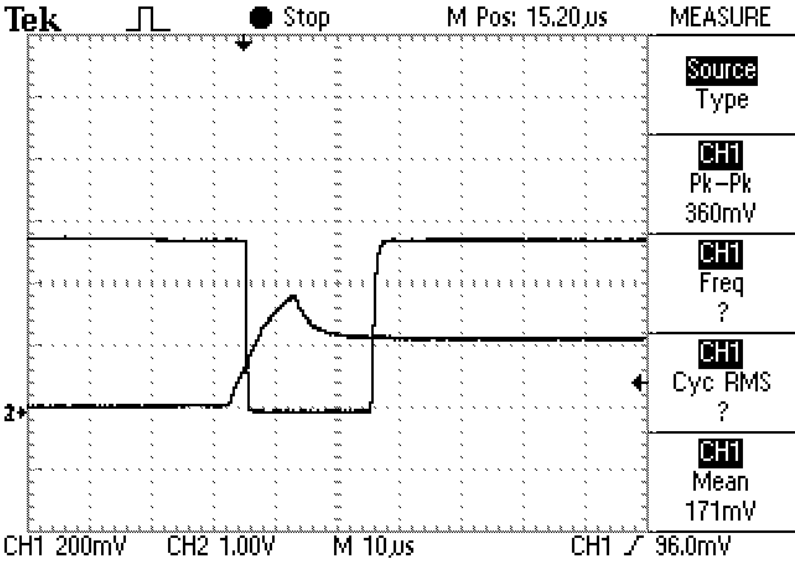
AOC(automatic output control)



MIN PWR STEP 15

SAT_DET(saturation detect)

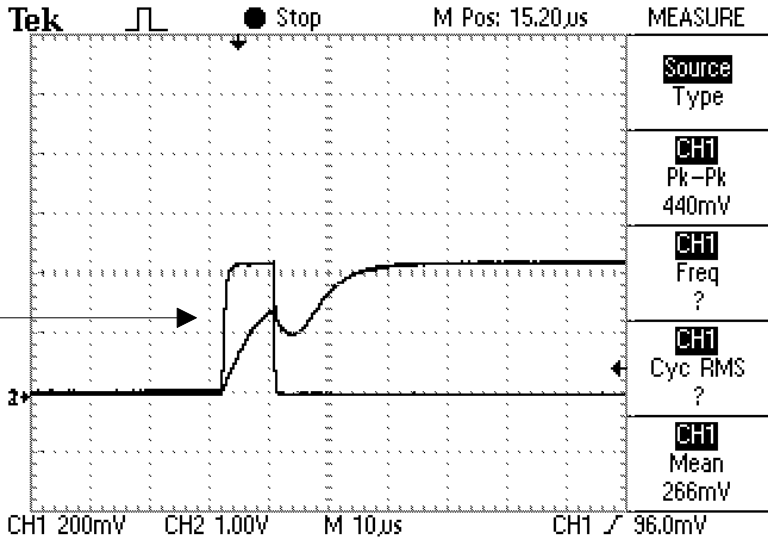
AOC(automatic output control)

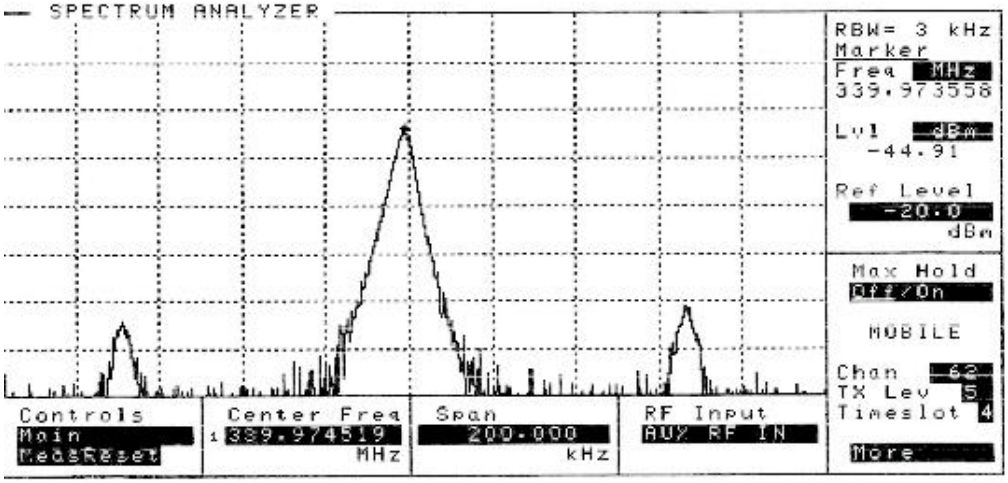


MAX PWR STEP 05

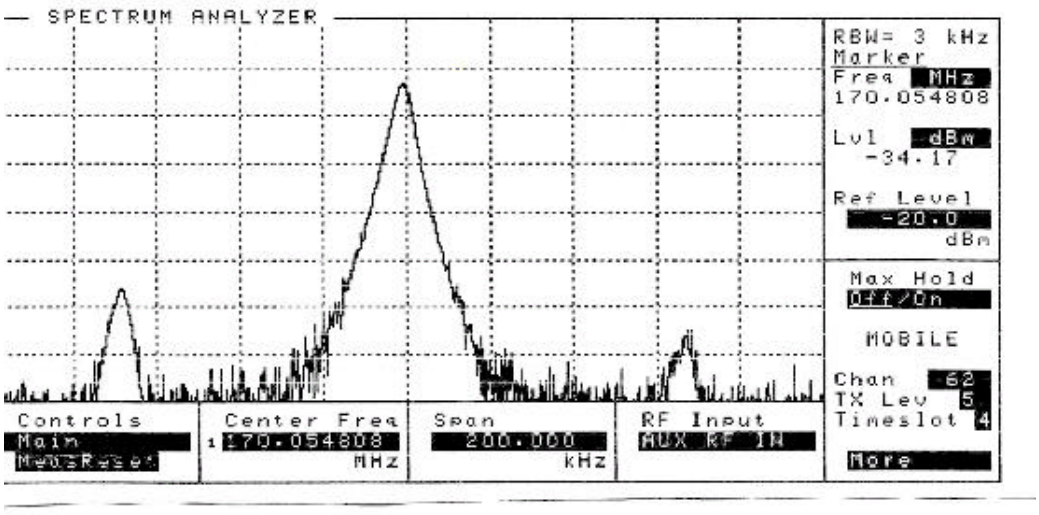
ACT(active loop) PAC IC pin 9

AOC(automatic output control)

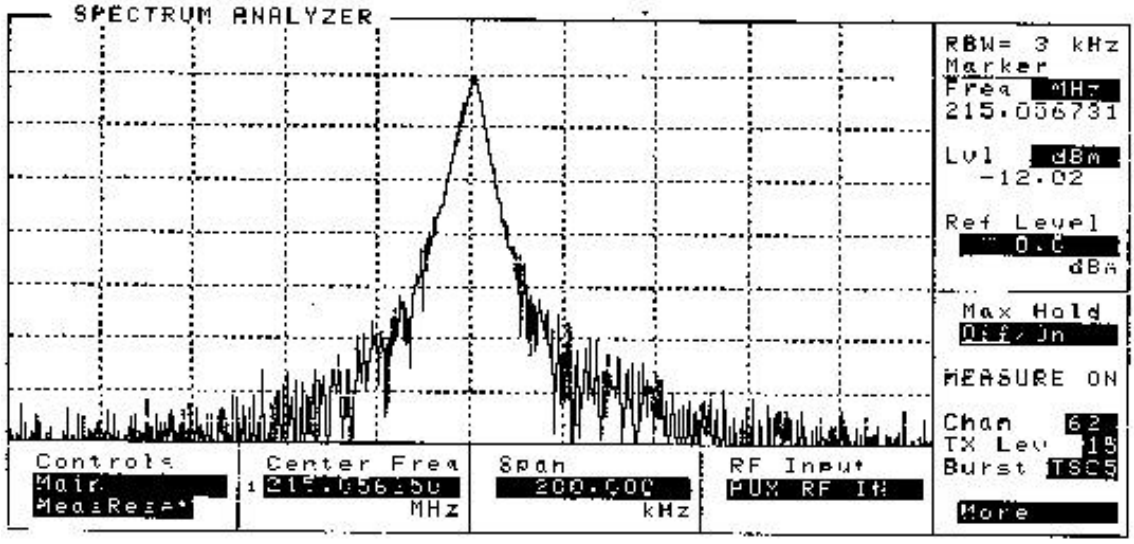




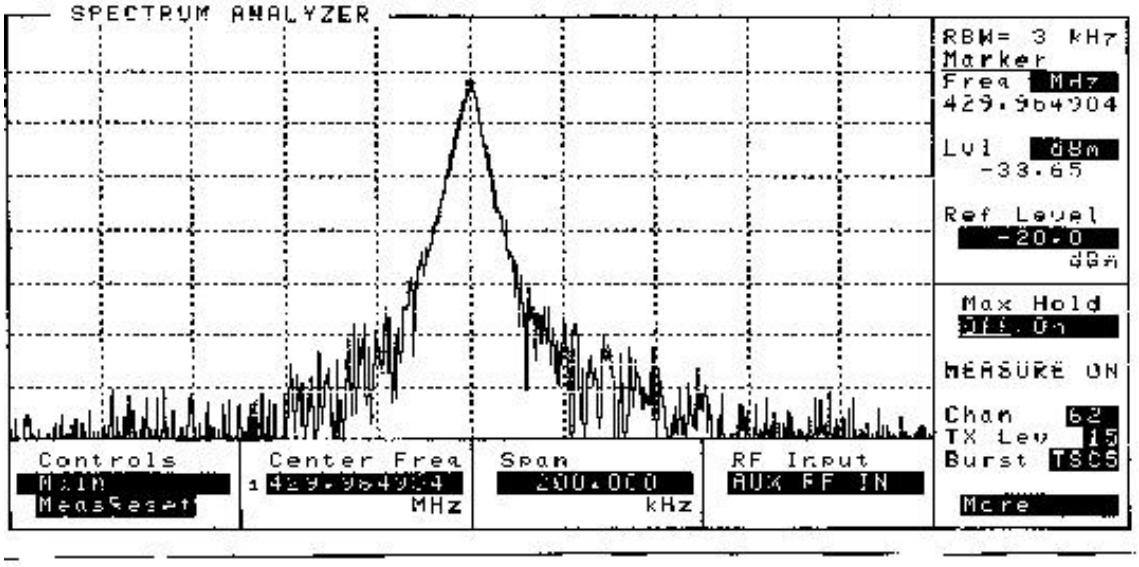
L.O. 340MHz
U201 pin 8



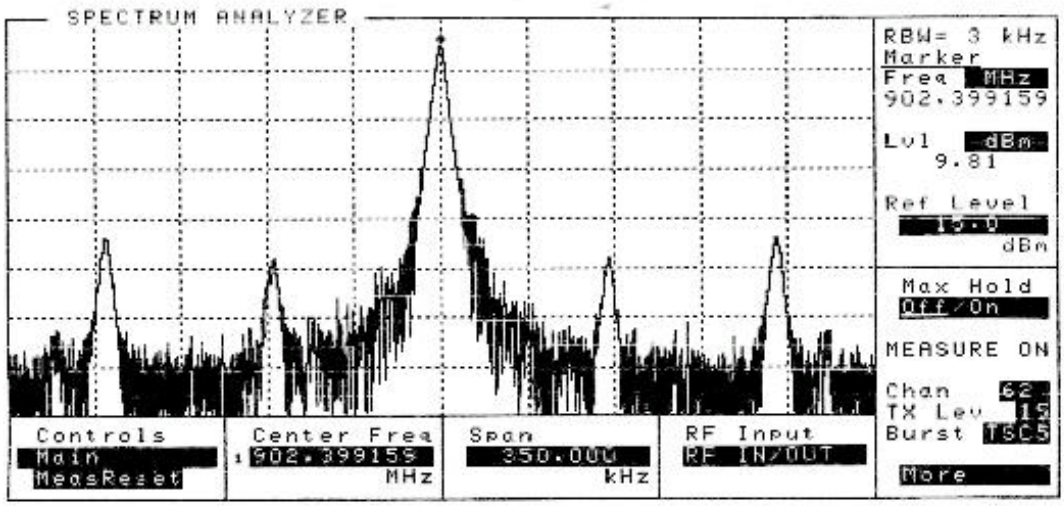
170MHz
U300 pin 4



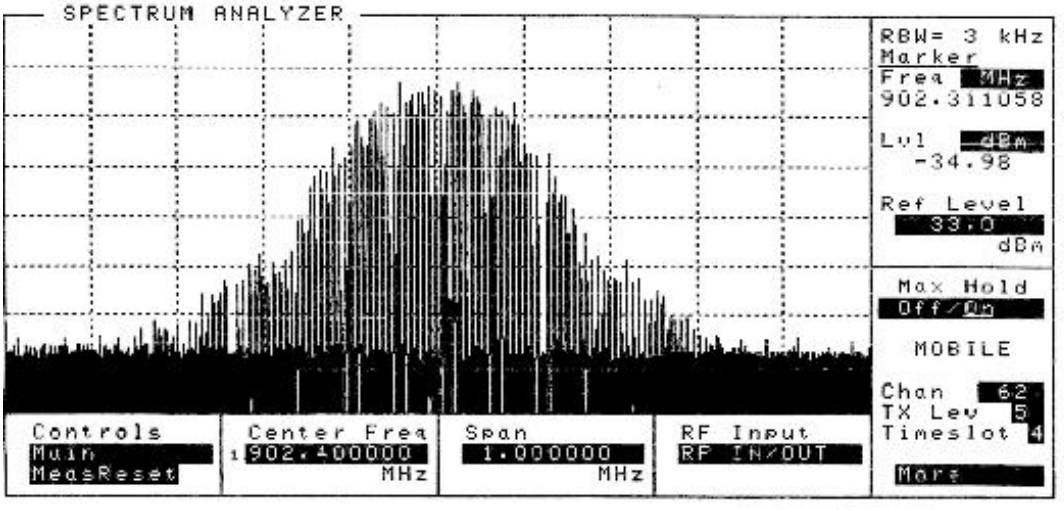
IF 215MHz
U201 pin 31



L.O. 430MHz
U201 pin 40



TX 110062# 1215# 40#



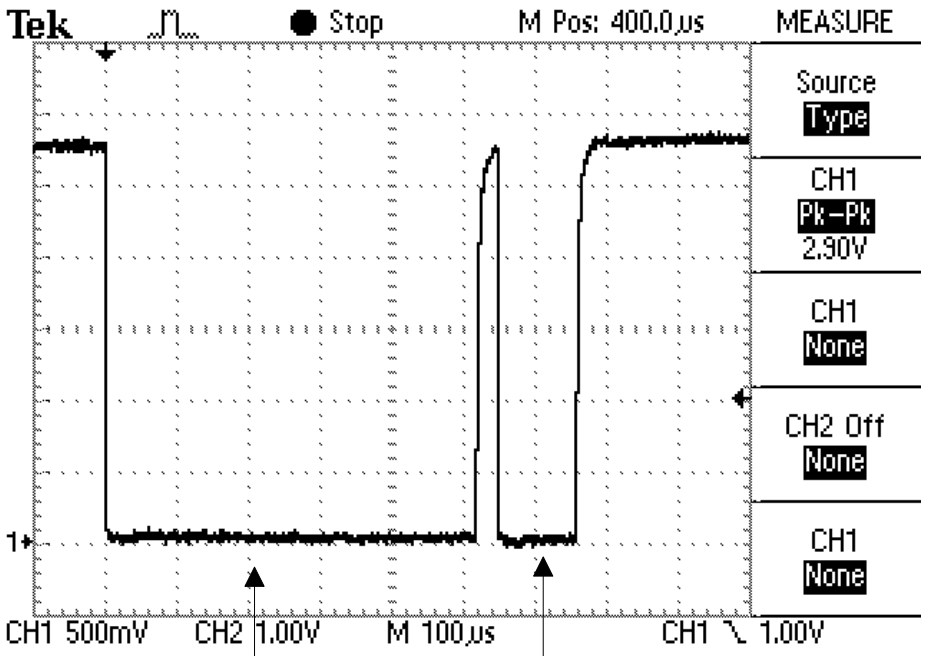
TX 110062# 1205# 310#

supplement 17
Invalid battery

Check in order:
0) Does the radio show invalid battery with both batteries?
1) The flip flex and the rear h.contacts (batt. serial data)
2) 49x# x=0-3 data main battery
3) 49x# x=4-7 data aux battery
4) J601 pin 11 main battery
5) J60 aux battery
6) Remove Q609 (from GSM STARTAC85 experience) and reanswer **0** question, after remove Q610.
7) See the diagram Initialization Procedure " Reset and Presence Pulse" page 31

Initialization Procedure"Reset and Presence Pulse"
490#

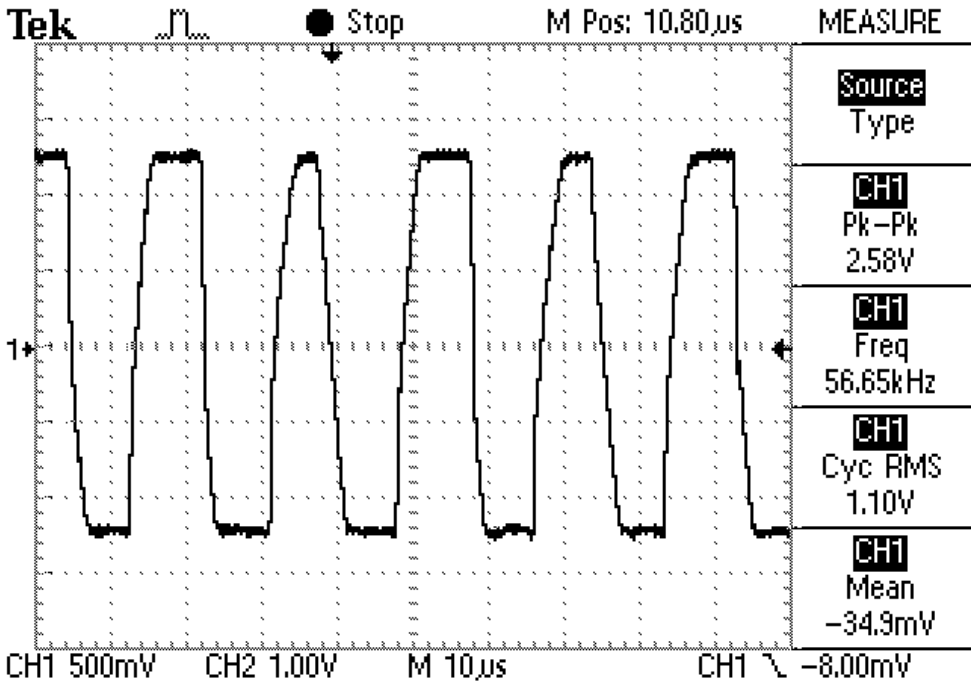
SCI_TX Q607 pin 1



Master TX "Reset Pulse"
500uS

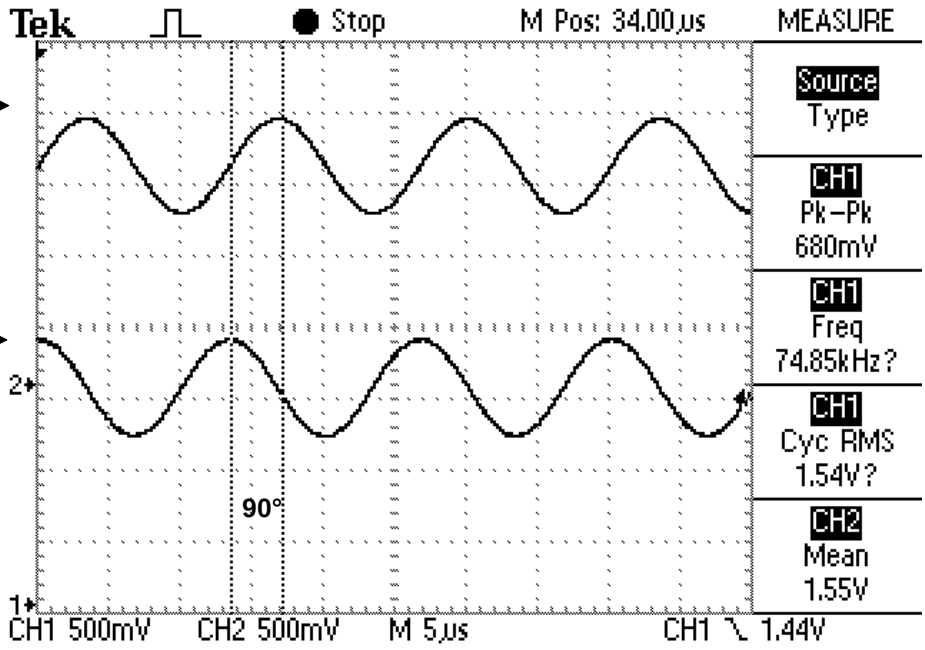
Master RX "Presence Pulse"
Main battery
100uS

RX_Q GIFSYN IC pin 48
CH 62 -100dBm



Q_signal U201pin 48

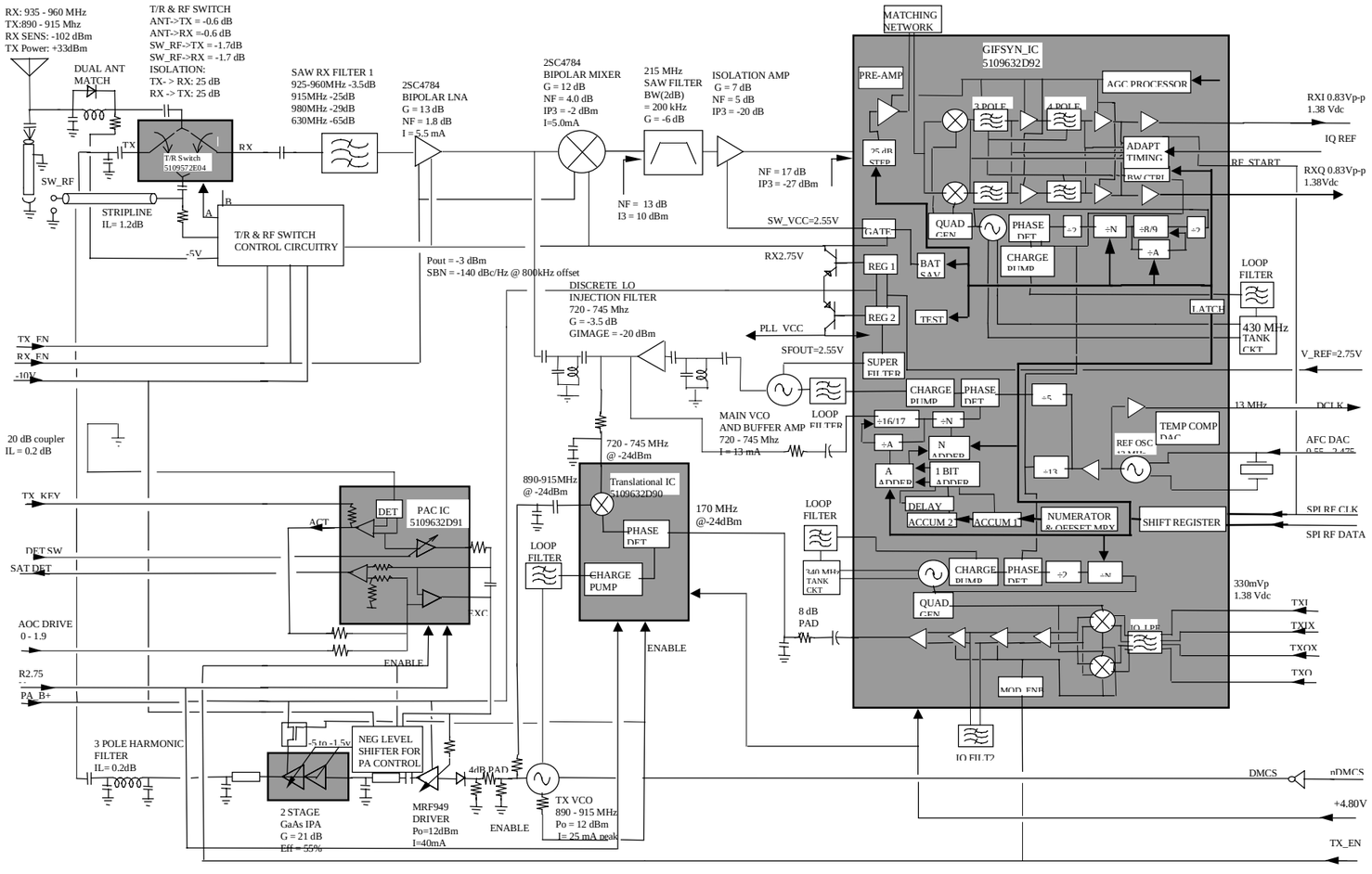
I_signal U201pin 46

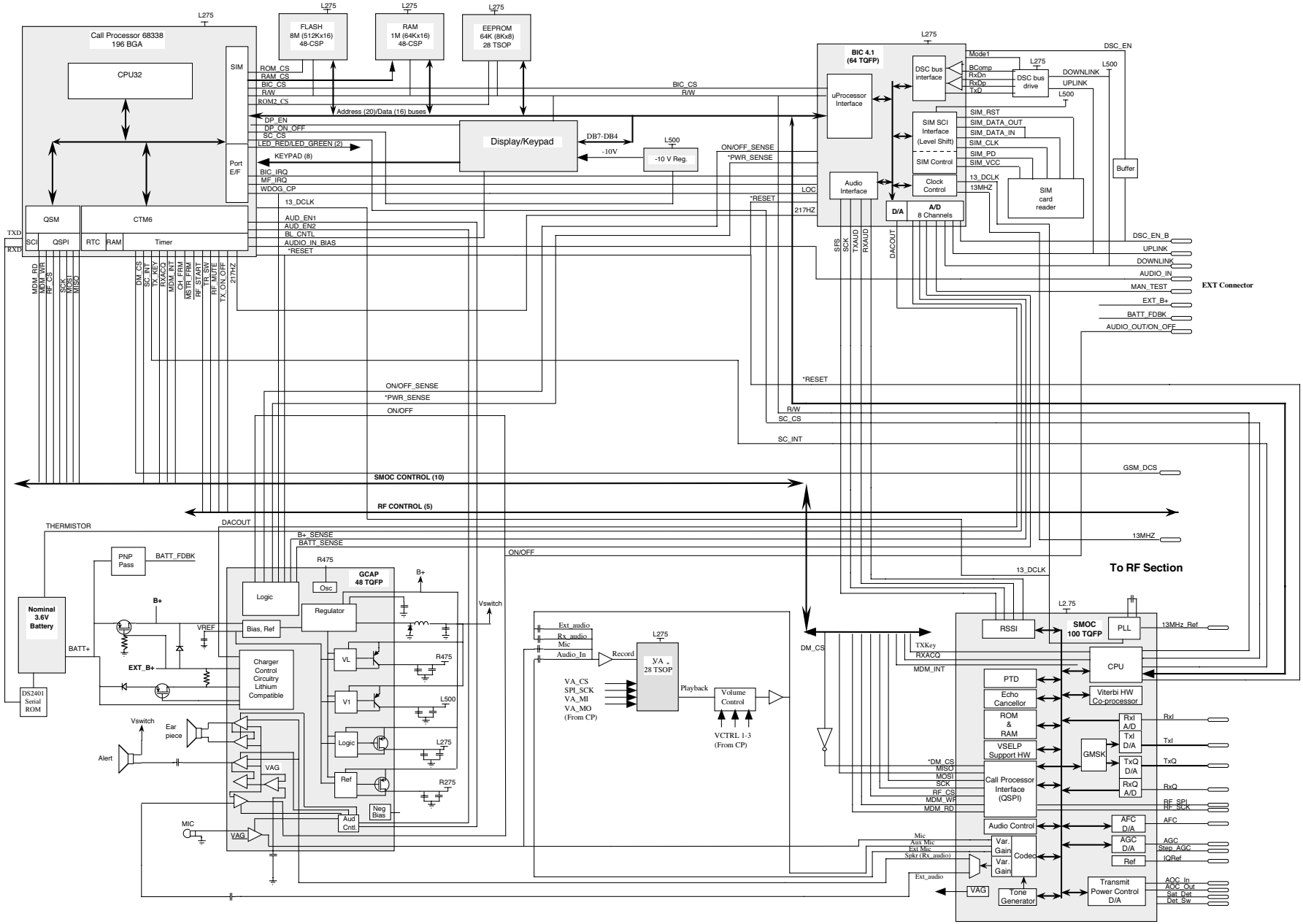


GSM KRUNCH RF BLOCK DIAGRAM

M. Denzin
February 26 1998
Version 1.2

Motorola Confidential Proprietary



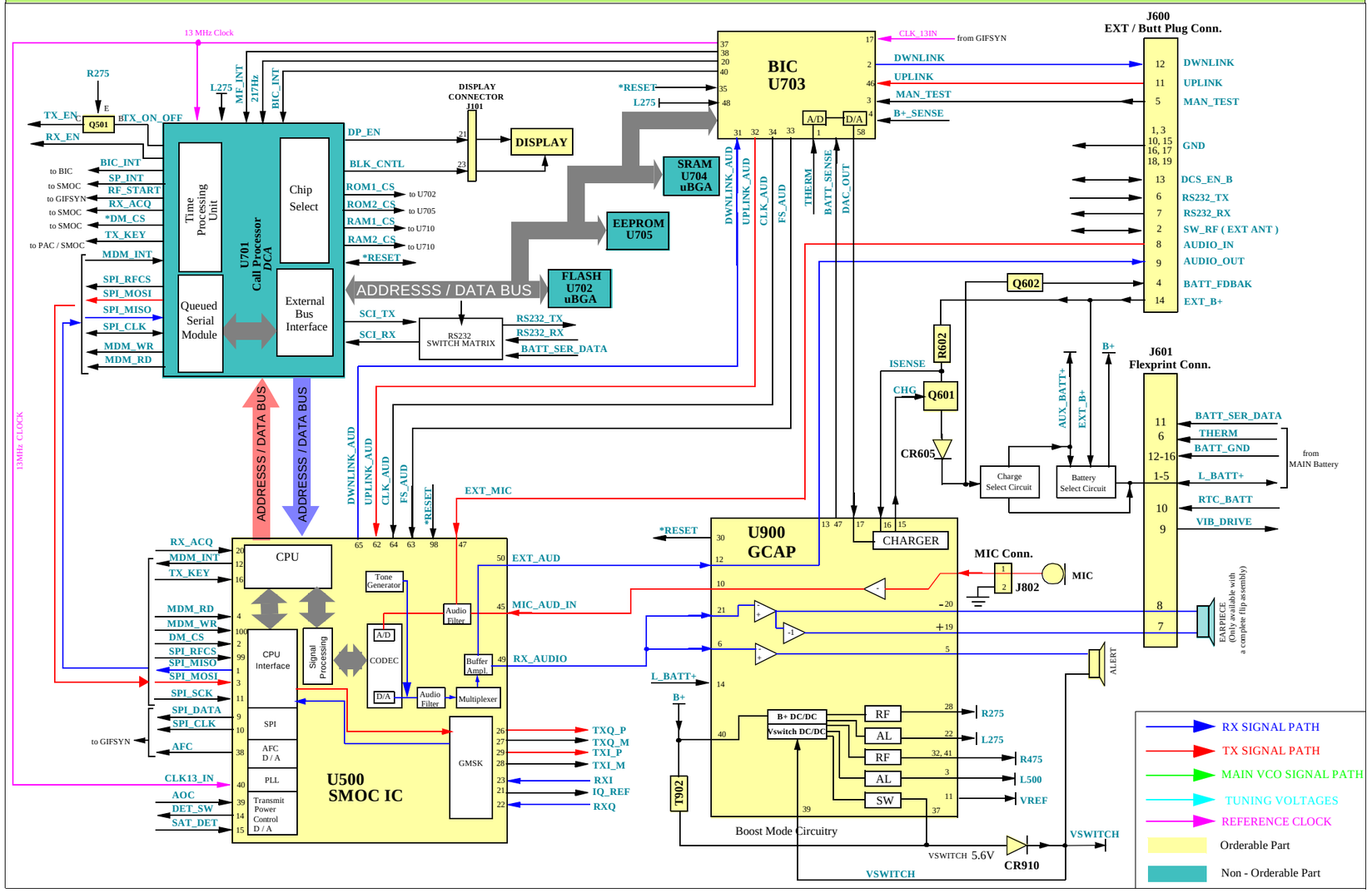


Digital Block Diagram

Motorola Confidential Proprietary

12 May 97

GSM KRUNCH AUDIO LOGIC BLOCK DIAGRAM



LOGIC BOARD SIGNALS

Measured in standby mode

RX_EN	2.8mVpp 10ms / cm	From the CPU (U701). When high, Rx path enabled and low muted. 1. Enables the Rf switch (U401) for receive mode. 2. Biases the mixer (Q420, and low noise amp (Q418).
TX_EN	7Vpp 10ms / cm	From CPU (U701), but inverted by Q501. High when 1. Enable the Rf switch for transmit mode & also the GIFSYN for transmit mode. 2. Supply Voltage for the PAC IC. 3. Isolates RF, by switching the PA Bias Circuitry (Not shown).
RESET	power on 2.8Vrms 200ms / cm	Controlled at power up by FCAP (U900) & CPU (U701). 1. Connected to CPU (U701), BIC (U703), SMOC (U500) After power up sequence, any chip can hold RESET low to power phone off if there is a problem.
DUAL_CS	2.8Vpp 100ns / cm	From CPU (U701) to Eprom. 1. Chip Enable controlling read/write access to and from Eprom (U702).
RAM1_CS	2.8Vpp 100ns / cm	From CPU (U701) to SRAM. 1. Chip Enable controlling read/write access to and from 1st half of SRAM (U704).
RAM2_CS	2.8Vpp 100ns / cm	From CPU (U701) to SRAM. 1. Chip Enable controlling read/write access to and from 2nd half of SRAM (U704).
ROM1_CS	2.8Vpp 100ns / cm	From CPU (U701) to Eprom. 1. Chip Enable controlling read/write access to and from Eprom (U702).
DP_EN	start up or press key 2.8Vpp 100ns / cm	From CPU (U701) to display, via connector J101. 1. Processor selects to enable display. When high, the display is enabled and low disabled.
SC_INT	start up or press key 2.8Vpp 2ms / cm	SMOC Interface. This is a signal from uP (U701) to SMOC (U500). 1) This is a 20ms timing signal from U701 which times the decoding and encoding function of the SMOC U500.
MF_INT	2.8Vpp 1ms / cm	From BIC to uP. This signal periodically interrupts the uP at 217Hz. During Power Saving mode this signal is set to DC.
BIC_INT	press a key 2.8Vpp 50us / cm	From BIC to uP. This signal interrupts the uP for a number of reasons. 1. Keypad detection 2. Power Sense 3. SIM Functions 4. DSC Bus Status Indicators
UPLINK	2.8Vpp 10us / cm	From butt plug (J600) to BIC chip (U703). This is a comms link from an external peripherale and the phone, and could be either data information or speech information. It is also used to sense the presence of a DHFA and the ignition status of the DHFA with DC levels
DOWNLINK	5Vpp 10us / cm	From BIC chip (U703) to butt plug (J600). This is a comms link from an external peripherale and the phone, and could be either data information or speech information. It is also used to sense the presence of a DHFA and the ignition status of the DHFA with DC levels
CLK_13_IN	1.6Vpp 50ns / cm	From GIF Syn to BIC IC - 13MHz clock.. This is the master clock reference required for the radio

Measured in test mode

AUDIO IN	test mode 08#, 10#, 36# 434#, 477# 2.7Vpp 5us / cm	External audio from butt plug, directly to SMOC IC
AUDIO OUT	test mode 08#, 10#, 36# 434#, 477# 2.8Vpp 5us / cm	External audio from SMOC via FCAP to butt plug
CLK_AUD	2.8Vpp 5us / cm	This signal is from the BIC to the SMOC It is a timing signal and runs at 512KHz, and times the transfer of speech information on the DSC Bus between BIC and SMOC.
FS_AUD	2.8Vpp 5us / cm	This signal is from the BIC to the SMOC It is a timing signal at 8KHz and provides for frame synchronisation during speech transfer on the DSC bus.

AL LAYER - ORDERABLE SPARES

Part Designator	Part Description	Part Number	Part Designator	Part Description	Part Number
AL800	Alert	5009473S01	Q501	Transistor TX_EN	4809607E05
CR605	Diode Charger Line	4809653F03	Q601	Power Transistor Chrg Line	4809579E17
CR910	Diode VSwitch Line	4809653F02	Q602	Transistor BATT_FDBACK LINE	4809939C04
J101	Display Connector	2809454C02	R602	Resistor for ISENSE	0680195M64
J600	EXT/Butt Plug Connector	0909449B04	T902	Choke / Switched Supply	2503788S08
J601	Flexprint Connector	0909059E01	U500	SMOC IC	5199332C04
J802	MIC Connector	0909195E01	U703	BIC IC	51097463E13
MIC	Microphone	5009135L07	U900	GCap IC	5109632D75

TEST COMMANDS

# press 2 sec.	Enter Manual Test Mode
01 #	Exit Manual Test Mode
07 #	Mute Rx Audio Path
08 #	Unmute Rx Audio Path
09 #	Mute Tx Audio Path
10 #	Unmute Tx Audio Path
11 #	Program Main Local Osc. to Channelbb
12 #	Set Tx Power level to fixed valure
19 #	Display SW Version Number of Call Processor
20 #	Display SW Version Number of Modem
22 #	Display SW Version Number of Speech Coder
25 #	Set Continuous AGC
26xxxx #	Set Continuous AFC
31x #	Initiate Pseudo-Random Sequence with Midamble
33xxx #	Synchronize to BCH Carrier
36 #	Initiate Acoustic Loopback
37 #	Stop Test
45xxx #	Serving Cell Power Level
46 #	Display Current Valure od AFC DAC
47x #	Set Audio Volume
58 / xxxxxx #	Display / Modify Security Code
59 / xxx #	Display / Modify Lock Code
60 #	Display IMEI
7100 #	Display Error Code

POWER UP DEBUG

Tie watchdog as shown in Signal Flow diagram, and supply power to radio:

- Check that there is B+ present at input to FCAP on pin 40. If not, could be problem with Battery Charger Circuitry (Q901)
- FCAP should then drive R275, L275 and VRef. If these are not present, could be a problem with FCAP itself.
- Verify collectors of regulators Q221 and Q222 are both around 2.75V.
- If ok, then check that the SMOC drives he Xtal Varactor Diode CR201 on the AFC line with a DC Voltage.
- If ok, then follow 13MHz path through GIF SYN & BIC and then to uP and SMOC.
- If ok, then check chip enables on Eprom, and SRams.
- If ok, then verify Reset Line.

COMMON PROBLEMS

Follows soon

FREQUENCIES

CHANNEL	Tx	Rx	MAIN VCO	Rx I.F	Rx I.F L.O	Tx I.F	Tx I.F L.O
1-Low	890.2	935.2	720.2	215	430	170	340
62-Middle	**902.4**	**947.4**	**732.4**	**215**	**430**	**170**	**340**
124-High	914.8	959.8	744.8	215	430	170	340

REVISIONS

Europe Middle East & Africa Customer Services	11.08.98
LEVEL 3 COLOUR DIAGRAMS	Rev. 1.0
GSM KRUNCH Block Diagram	
Colin Jack, Michael Hansen, Billy Jenkins, Ralf Lorenzen	Page 1 of 2

Europe, Middle East & Africa Customer Services

Level 3 Authorised

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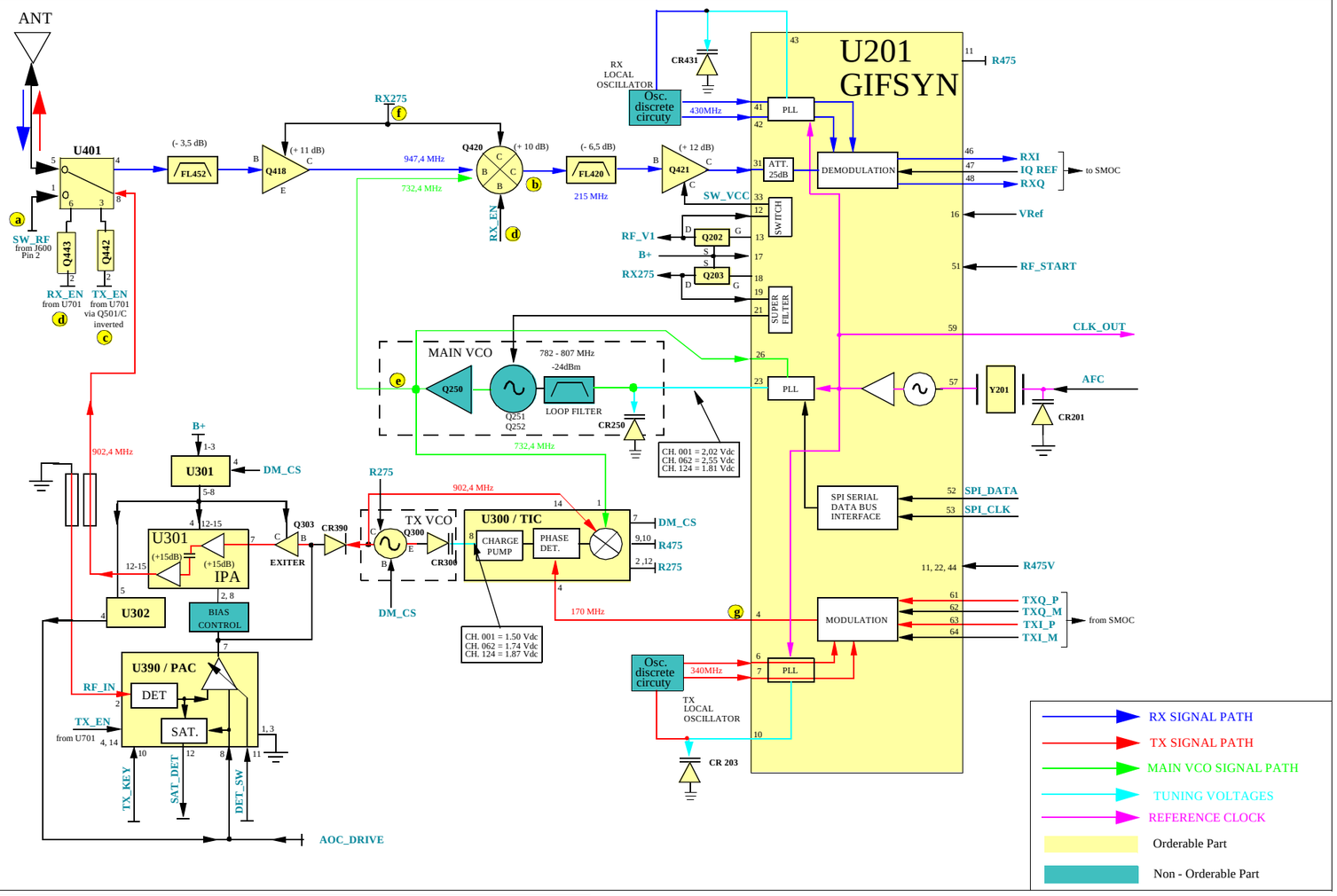
GSM KRUNCH RF BLOCK DIAGRAM



RF BOARD SIGNALS

Tx SIGNALS - 11062#, 1215#, 310#

Frequency 217Hz - 1ms/cm

SAT_DET	3Vpp	Signal from PAC to SMOC. When PA is at or near saturation signal is low, telling SMOC to reduce AOC drive When the PA is not near saturation this is high, telling SMOC to increase AOC drive.
DET_SW	Power Step: 04-11 - 50mVpp 12-15 - 900mVpp	Signal from the SMOC to the PAC When this signal is low, the internal gain in the PAC is unity. When this signal is high, the internal gain in the PAC is 1.
TX_KEY	2,75Vpp	From uP to PAC. This is a timing signal to the PAC to provide the current path for the initial loop precharge
AOC	Power Step: 04 - 520mVpp 15 - 280mVpp	Signal from SMOC to PAC. This is a linear control voltage for ramp up and ramp down of the PA output level. This controls the voltage on the exciter control output (EXC) from the PAC.
TX_EN	3Vpp	Signal from uP but inverted via Q501 and used to time:- 1. GIF SYN 2. TX VCO 3. PAC 4. RF Switch Enables Tx Path when high
DM_CS	2,8Vpp	Signal from uP inverted via Q502. Enables TIC, PA and TX VCO. When high, this enables Tx path.
TXI	2.1Vpp	From SMOC IC to GIF SYN This signal is the in-phase input to the I-Q Modulator of the GIF SYN.
TXQ	2.1Vpp	From SMOC IC to GIF SYN This signal is the quadrature input to the I-Q Modulator of the GIF SYN.

Modem Callprocessor Interface

MDM_RD	2,8Vpp 500us/cm	From uP to SMOC. This signal indicates when the uP is reading data from the SMOC. High when enabled.
MDM_WR	2,8Vpp 500us/cm	From uP to SMOC. This signal indicates when the uP is writing data to the SMOC. High when enabled.

Rx SIGNALS - In Standby Mode

RX_ACQ	2,8Vpp 500us/cm	From uP to SMOC This is an interrupt from the uP to the SMOC. When high this indicates to the SMOC the beginning of the receive burst.
RF_START	2,8Vpp 20us/cm	From uP to GIF SYN Signal to drive the GIFSYN IC. This is a pulsed signal which controls the sending of SPI data to the GIFSYN for all RF functions.-

Rx SIGNALS - 110062#, 262000#, 25013#, 241#

Frequency 217Hz - 1ms/cm

RXI	1.8Vpp 500us/cm	From GIF Syn to SMOC IC. This is a baseband analogue signal to A/D convertors of SMOC
RXQ	1.8Vpp 500us/cm	From GIF Syn to SMOC IC. This is a baseband analogue signal to A/D convertors of SMOC
IQ_REF	1.38Vrms 500us/cm	From SMOC to GIF Syn. This is a DC level from SMOC for the RXI and Q signals to ride on.

RF LAYER - ORDERABLE SPARES

Part Designator	Part Description	Part Number	Part Designator	Part Description	Part Number
A1	Antenna Connector	3909101E01	Q442	Transistor Switch Ant. Matrix	4809939C08
CR201	Master Xtal Varactor	4809641F04	Q443	Transistor Switch Ant. Matrix	4809939C08
CR203	Tx Local VCO Varactor	4809877C10	SH 201	Main VCO Can	2609053T01
CR250	Main VCO Varactor	4809877C09	SH 202	GIF SYN Can	2609058T01
CR300	Tx VCO Varactor	4809877C09	SH 203	Master Xtal Can	2609059T01
CR390	TX Isolation	4809948D13	SH 301	TIC Can	2609054T01
CR431	Rx Local VCO Varactor	4809877C10	SH 302	IPA Can	2609055T01
FL420	1st Rx Filter	9109035M01	SH 401	Iso.Amp. Can	2609056T01
FL452	IF Saw Filter	9109247M01	SH 402	Mixer Can	2609060T01
J600	EXT Antenna Connector	0909449B04	SH 501	Smoc IC Can	2609057T01
Q202	GIF SYN Power Transistor	4809579E18	U201	GIFSYN IC	5109632D92
Q203	Receive Power Transistor	4809579E18	U300	TIC IC	5109632D90
Q300	Tx VCO Transistor	4809527E24	U301	Switch Control IC	5109908K25
Q301	PA Power Transistor	4809807C24	U302	IC	5109817F11
Q303	Exiter Transistor	4809527E24	U310	PA Control IC	5109632D91
Q418	Rx Amplifier Transistor	4809527E20	U401	Antenna Switch IC	5109572E04
Q420	Mixer Transistor	4809527E20	Y201	Master Xtal - 13MHz	4809612J20
Q421	Iso.Amp. Transistor	4809527E24			

TEST COMMANDS

# press 2 sec.	Enter Manual Test Mode
01 #	Exit Manual Test Mode
07 #	Mute Rx Audio Path
08 #	Unmute Rx Audio Path
09 #	Mute Tx Audio Path
10 #	Unmute Tx Audio Path
11 #	Program Main Local Osc. to Channel
12 #	Set Tx Power level to fixed valure
19 #	Display SW Version Number of Call Processor
20 #	Display SW Version Number of Modem
22 #	Display SW Version Number of Speech Coder
25 #	Set Continuous AGC
26xxxx #	Set Continuous AFC
31x #	Initiate Pseudo-Random Sequence with Midamble
33xxx #	Synchronize to BCH Carrier
36 #	Initiate Acoustic Loopback
37 #	Stop Test
45xxx #	Serving Cell Power Level
46 #	Display Current Valure od AFC DAC
47x #	Set Audio Volume
58 / xxxxxx #	Display / Modify Security Code
59 / xxx #	Display / Modify Lock Code
60 #	Display IMEI
7100 #	Display Error Code

RECEIVE DEBUG

Put the phone in test mode and key in commands: 110062#, 262000#, 25013#, 241#. Test for a set level eg. (-30dB' s) at point (a) to compensate cable losses.

The only real short-cut we can take is by probing the 215MHz test point (pin 31of GIF or point (b) .)

- **If the 215 is OK** then we can assume problem lies around GIF, either 430MHz Local Oscillator or in generation of **RXI** and **RXQ**. The peel off can **SH202** should then be removed. Check that **IQ Ref** from the SMOC is around 1.38Vdc and then the **RXI and Q** outputs from the GIF to check which is faulty. Before actually removing any cans it may be worth checking the **RX_EN** and **RX275** lines at points (d) and (f).
- If, as in most cases the **215Mhz is low** there is no choice but to remove the LNA/MIXER can (**SH402**) and probe the R.F inputs to the Mixer to see which RF path (947.4 or 732,.4) the fault lies on.
- **If 732.4 is low**, and 947.4 is OK, the main suspicions are with the main VCO and this can should be removed (**SH201**)
- **If 947.4 is low**, and the 732.4 OK, the main suspicions are with the input filter FL452 and this can (**SH402**) should be removed, and if low at the input to these, it could be losses caused by the Rf Switch (U401).
- If **947.4 and 732.4 RF values are fine but 215MHz into GIF is low** (b) then we must also remove can covering filters (**SH401**) as SAW filter (FL420) and IF Pre AMP (Q421) is located under here.

TRANSMIT DEBUG

Put the phone into test mode and key in the commands: 110062#, 1200#, 310#

Firstly if no **902.4 is generated** we should check for 170 at point (g) and the 732.4 at point (e) to establish which of the signals are missing or if both the signals are missing.

- **If 170 is missing and 732.4 is fine** then remove **SH 202** and check for the 340 Mhz at GIF SYN.
- **If we have no 340 and therefore no 170** then could be CR203 or GIFSYN problem. Check Q202 and Q203 have both 2.7V. If still no problems found, remove **SH301** & measure **DM_CS** on U300 Pin7. Could also be SMOC problem.
- **If 340 is ok but 170 not**, remove **SH301** and look for problems around U300. Could be problems with TIC, GIF SYN or SMOC.
- **If 732.4 is missing but 170 is fine** remove **SH201** and look for faults. Could be a problem with CR250, GIF SYN or SMOC. Check collectors of Q202 and Q203 for 2.7V.
- **If both 732.4 and 170 are missing** then check the collectors of Q202 and Q203 for 2.7V. If ok, then remove **SH**301 and probe **DM_CS** on pin 7 of U300. Possible GIF SYN or SMOC problem.
- **If 902.4 is generated but is low** then we look for problems under **SH301 and SH302** and follow path through to antenna
- **If 902.4 looks OK but fails in wingate** check at the T/R switching circuitry (Q442, Q443, U401) switching RF to J600 or with the J600 connector itself. Use rf lead connected to J600

FREQUENCIES

CHANNEL	Tx	Rx	MAIN VCO	Rx I.F	Rx I.F L.O	Tx I.F	Tx I.F L.O
1-Low	890.2	935.2	720.2	215	430	170	340
62-Middle	**902.4**	**947.4**	**732.4**	**215**	**430**	**170**	**340**
124-High	914.8	959.8	744.8	215	430	170	340

REVISIONS

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LEVEL 3 COLOUR DIAGRAMS	Rev. 1.0
GSM KRUNCH Block Diagram	
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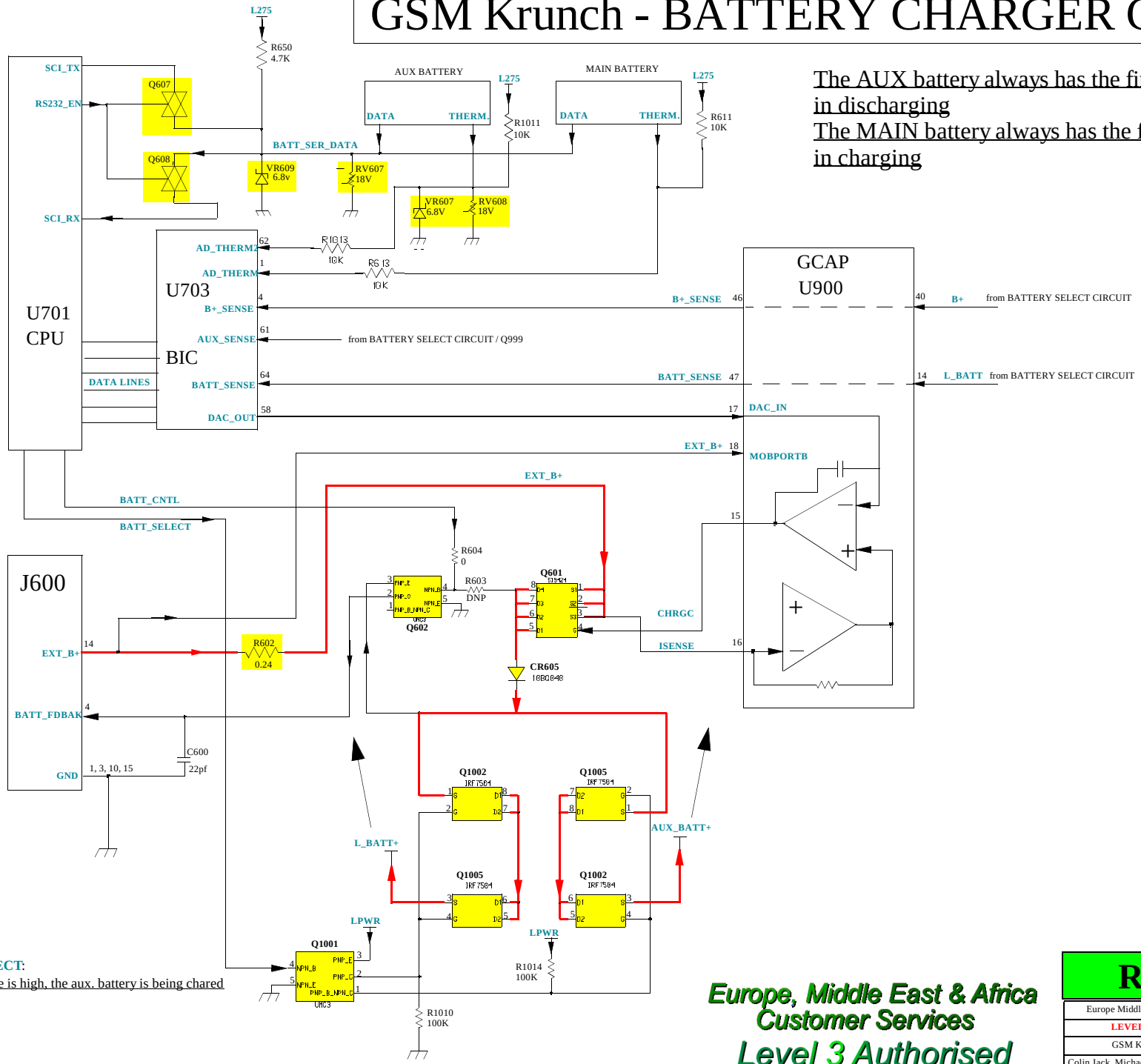
GSM Krunch - BATTERY CHARGER CIRCUIT



The AUX battery always has the first priority in discharging
The MAIN battery always has the first priority in charging

BATT_SELECT:
When this line is high, the aux. battery is being chared

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REVISIONS

Europe Middle East & Africa Customer Services	10.08.98
LEVEL 3 COLOUR DIAGRAMS	Rev. 1.1
GSM Krunch Battery Select Circuit	
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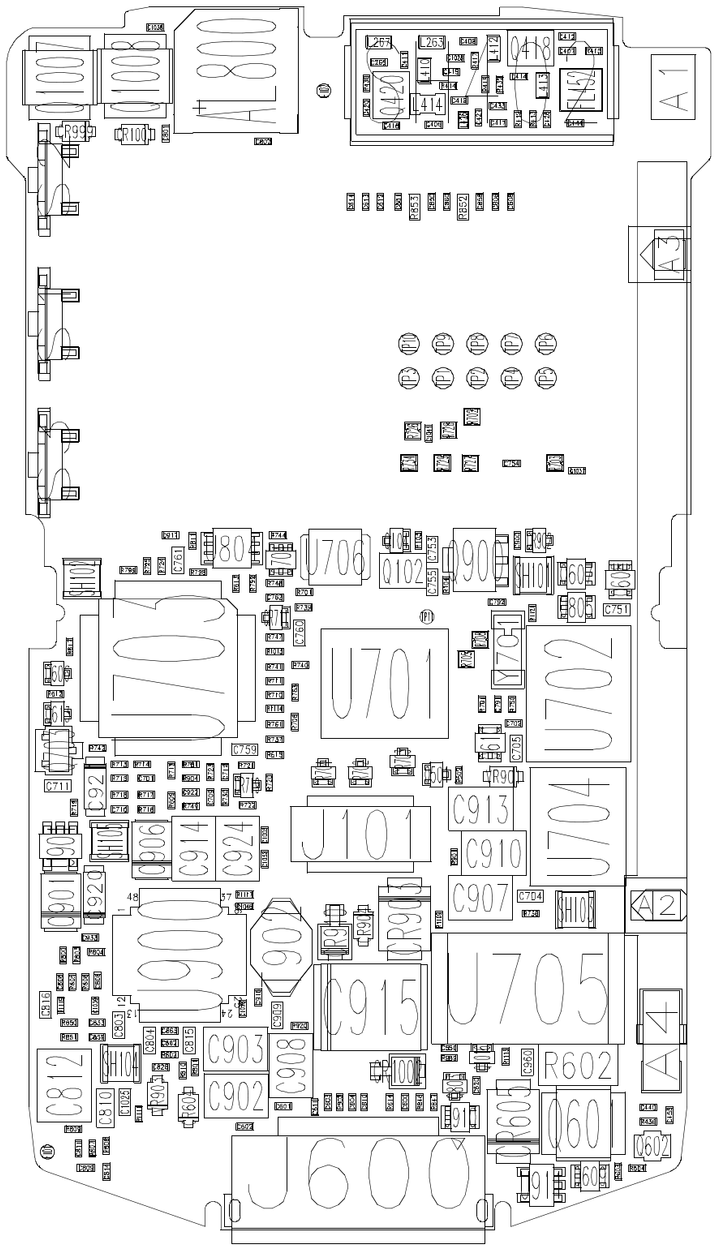
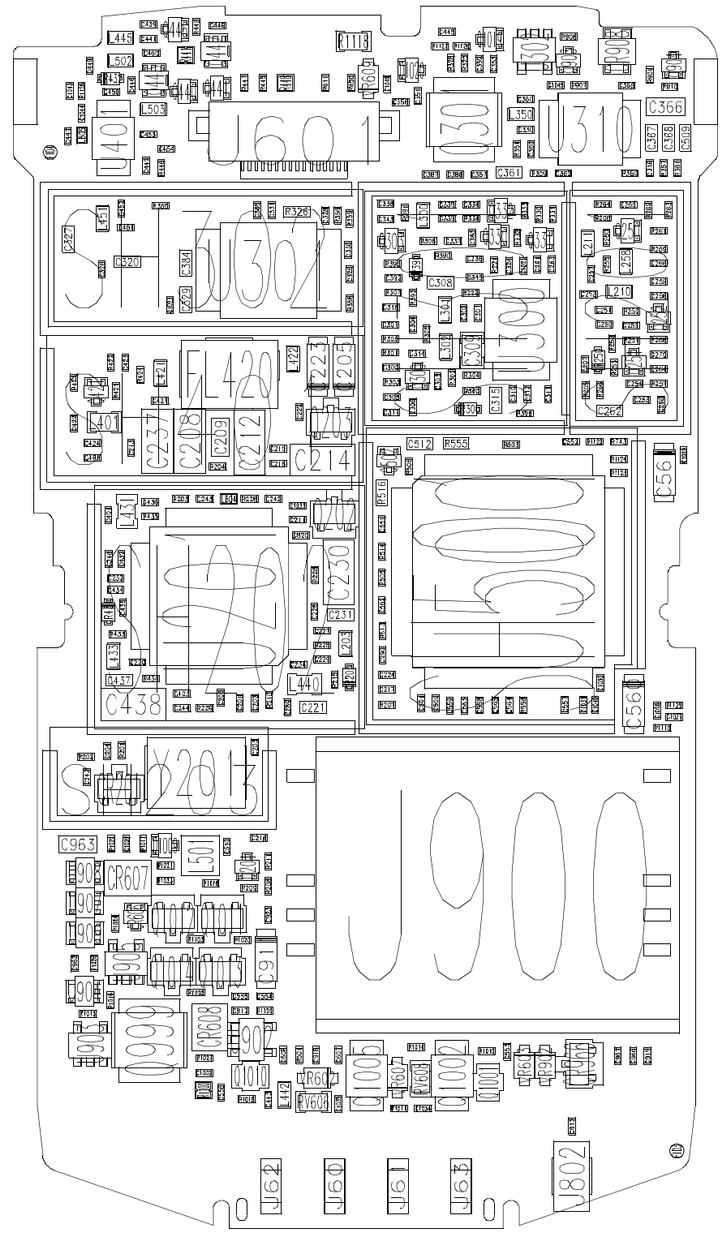
GSM KRUNCH _P14





LOGIC OVERLAY
84D09253M01
DATE: 05/26/98

GSM KRUNCH
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SCALE 4:1

RF OVERLAY
84D09253M01
DATE: 05/26/98

GSM KRUNCH
ISSUE: P14
SCALE 4:1

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GSM KRUNCH_P12 / Board M04

DUAL RF SWITCH

LNA

REC. FRONT END

MIXER

ISO. AMP

VCO

TX_VCO

PA BIAS CONTROL

PA OUTPUT MATCH

IPA

PA INPUT MATCH

TX_ATTENUATOR

28 dB Coupler

GSM Service Support
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REVISIONS

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Customer Services
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Startac 130

3V, 900Mhz
GSM CELLULAR PHONE

Europe, Middle East & Africa Customer Service Policy

Issue 1.2
12th Jun 98

Motorola Inc.
Cellular Subscriber Sector
European Cellular Subscriber Group
Easter Inch, Bathgate
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SECTION 1.0 - SERVICE POLICY

1.1 Warranty:

Product will be sold with the standard 12 months warranty terms and conditions. Accidental damage misuse, retailers extended warranties will not be supported under warranty. Non warranty repairs will be available at agreed fixed repair prices.
Proof of purchase will be required to validate warranty claims.

1.2 Out Of Box Failure Policy:

The standard OOB Failure criteria will apply. Early life customer units which fail within less than 30 minutes as measured by the Life Time Call Timer, to be returned to Manufacturing for root cause analysis, to guard against epidemic criteria. Manufacturing to bear the costs of early life failure.

1.3 Product Support:

The product will be supported under a mid/high tier Loaner program or alternative low cost service strategy (To be agreed with European Customer Service Manager). Exchange units will not be available. Customers original telephones will be repaired but not refurbished as standard.

The first 100 fails found in the EMEA Region should be reported to the European Technical Support Group and the faulty units sent for their attention.

For the first 3 to 6 months in field, Motorola Hi-Tech Centres only will perform all repairs (Level 1, 2, 3 and 4) in order to give accurate and detailed feedback to engineering.

After this period appointed Motorola Service Hubs will perform warranty and non warranty field service for level 2 (assemblies) and level 3 (limited pcb component). The Motorola HTC centres will perform level 4 (full component) repairs.

1.4 Customer Support:

Customer support (End user) will be available through dedicated Call Centres and In Country Help desks.

SECTION 2.0 - SERVICE REQUIRMENTS

2.1 Training and Documentation

Europe, Middle East & Africa
Customer Services
Level 1 & 2 Authorised

Level 1 Service will be replace for new & Level 2 Service will include the repair of main mechanical parts only.

Documentation Available:

* User Manual
* Accessories Manual
* Level 1 and 2 Service Manual
* Photographics Parts List and Variances for mechanical Parts Only
* Marketing Information Pack

Training:

Training will be carried out if necessary, by local training representative.

Europe, Middle East & Africa
Customer Services
Level 3 Authorised

Level 3 Service will consist of repair of all main mechanical parts and also top 30-40 electrical parts, by external Motorola Authorised Repair Centres only.

Documentation Available:

* Product Service Preview
* Level 3 Colour Diagrams and Board Layouts
* Troubleshooting Guide
* Top Failures List
* Level 3 Limited Parts List
* Full Board Overlays

Training

Level 4 training will be given to all Regional Technical Trainers who will in turn provide training for all Level 3 hubs in their regions.

MOTOROLA

Mechanical Spare Parts Listing

Version 1.2

4th Nov 1998

StarTAC 130 - Krunch

Xcvr Item Number		SWF2952J	SWF3266AA
Product	-	Krunch	Krunch
Additional Info	-	**Phase 1**	**Phase 2**
Colour	-	Black	Black
Make	-	Motorola	Motorola
System	-	GSM	GSM
Spare Xcvr Number	-	S8308A	S8309A
Spare PCB Number	-	Not Available	Not Available
Frnt Hsng Assy	-	CCLN4540A	CCLN4540A
..Assy Flip	-	0104866Z03	0104866Z03
..Frnt Hsng Assy	-	0109279U03	0109279U03
..Shaft GSM Right	-	4709050R01	4709050R01
..Hinge GSM	-	5509242E01	5509242E01
..Rear Hsng Assy	-	0109280U05	0109280U05
..Holder SIM Card	-	1509117T03	1509117T03
..Lens	-	6104522Z02	6104522Z02
H&H StartTAC 160 Common	-	SHN6658A	SHN6658A
..Grommet Display	-	0509133T01	0509133T01
..Grommet Mic	-	0509440M01	0509440M01
..Grommet Alert	-	0509441M01	0509441M01
..Adhesive DCA Cover	-	1109155J01	1109155J01
..Hsng Flex Cover	-	1509237S02	1509237S02
..Tube Antenna	-	3709068T01	3709068T01
..Kypd Hardtop 19 Pos	-	3803882K01	3803882K01
..Sleeve Interboard Connector	-	4309293K01	4309293K01
..Mic Elect 6mm	-	5009135L07	5009135L07
..Label Power Audio Flex	-	5403801S01	5403801S01
..Antenna	-	8509098E01	8509098E01
..Keyboard	-	SYN6812A	SYN6812A
..Sw Array Kypd	-	4003745K01	4003745K01
..LCD Display	-	7209257T03	7209257T03

Eschuteon Inside Flip	StarTAC	SYN5662A
	TIM	5409363M85
	Airtel	5409363M87

Parts Not Available

Part Number Change

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Customer Services

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GSM Krunch Level 3 Parts

AL LAYER / ORDERABLE SPARES

Part Designa-tor	Part Description	Part Number	Part Designator	Part Description	Part Number
AL800	Alert	5009473S01	Q501	Transistor TX_EN	4809607E05
CR605	Diode Charger Line	4809653F03	Q601	Power Transistor Chrg Line	4809579E17
CR910	Diode VSwitch Line	4809653F02	Q602	Transistor BATT_FDBACK LINE	4809939C04
J101	Display Connector	2809454C02	R602	Resistor for ISENSE	0680195M64
J600	EXT/Butt Plug Connector	0909449B04	T902	Choke / Switched Supply	2503788S08
J601	Flexprint Connector	0909059E01	U500	SMOC IC	5199332C04
J802	MIC Connector	0909195E01	U703	BIC IC	5109743E13
MIC	Microphone	5009135L07	U900	GCap IC	5109632D75

RF LAYER / ORDERABLE SPARES

Part Designa-tor	Part Description	Part Number	Part Designator	Part Description	Part Number
A1	Antenna Connector	3909101E01	Q442	Transistor Switch Matrix	4809939C08
CR201	Master Xtal Varactor	4809641F04	Q443	Transistor Switch Matrix	4809939C08
CR203	Tx Local VCO Varactor	4809877C10	SH 201	Main VCO Can	2609053T01
CR250	Main VCO Varactor	4809877C09	SH 202	GIF SYN Can	2609058T01
CR300	Tx VCO Varactor	4809877C09	SH 203	Master Xtal Can	2609059T01
CR390	TX Isolation	4809948D13	SH 301	TIC Can	2609054T01
CR431	Rx Local VCO Varactor	4809877C10	SH 302	IPA Can	2609055T01
FL420	1st Rx Filter	9109035M01	SH 401	Iso.Amp. Can	2609056T01
FL452	IF Saw Filter	9109247M01	SH 402	Mixer Can	2609060T01
J600	EXT Antenna Connector	0909449B04	SH 501	Smoc IC Can	2609057T01
Q202	GIF SYN Power Transistor	4809579E18	U201	GIFSYN IC	5109632D92
Q203	Receive Power Transistor	4809579E18	U300	TIC IC	5109632D90
Q300	Tx VCO Transistor	4809527E24	U301	Switch Control IC	5109908K25
Q301	PA Power Transistor	4809807C24	U302	IC	5109817F11
Q303	Exiter Transistor	4809527E24	U310	PA Control IC	5109632D91
Q418	Rx Amplifier Transistor	4809527E20	U401	Antenna Switch IC	5109572E04
Q420	Mixer Transistor	4809527E20	Y201	Master Xtal - 13MHz	4809612J20
Q421	Iso.Amp. Transistor	4809527E24			

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